SUBSTITUTE SEQUENCE LISTING

<110:	> JESTIN, JEAN-LUC VICHIER-GUERRE, SOPHIE FERRIS, STEPHANE	
<120	> METHODS FOR OBTAINING THERMOSTABLE ENZYMES, DNA POLYMERASE I VARIANTS FROM THERMUS AQUATICUS HAVING NEW CATALYTIC ACTIVITIES, METHODS FOR OBTAINING THE SAME, AND APPLICATIONS OF THE SAME	
<130	> 295295US-10590810	
	> 10/590,810 > 2006-08-25	
	> PCT/IB05/00734 > 2005-02-25	
	> 10/787,219 > 2004-02-27	
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ttt Phe	gtg Val	ctt Leu	tcc Ser 35	cgc Arg	aag Lys	gag Glu	ccc Pro	atg Met 40	tgg Trp	gcc Ala	gat Asp	ctt Leu	ctg Leu 45	gcc Ala	ctg Leu	143	
gcc Ala	gcc Ala	gcc Ala 50	agg Arg	G17 333	ggc Gly	cgg Arg	gtc Val 55	cac His	cgg Arg	gcc Ala	ccc Pro	gag Glu 60	cct Pro	tat Tyr	aaa Lys	191	
gcc Ala	ctc Leu 65	agg Arg	gac Asp	ctg Leu	aag Lys	gag Glu 70	gcg Ala	cgg Arg	gly ggg	ctt Leu	ctc Leu 75	gcc Ala	aaa Lys	gac Asp	ctg Leu	239	ı
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gly aaa	gtg Val	gcc Ala	cgg Arg 115	cgc Arg	tac Tyr	ggc Gly	Gly 999	gag Glu 120	tgg Trp	acg Thr	gag Glu	gag Glu	gcg Ala 125	Gly 999	gag Glu	383	\$
cgg Arg	gcc Ala	gcc Ala 130	ctt Leu	tcc Ser	gag Glu	agg Arg	ctc Leu 135	ttc Phe	gcc Ala	aac Asn	ctg Leu	tgg Trp 140	gly aaa	agg Arg	ctt Leu	431	Ĺ
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Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser 65 70 75 80	
Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro 85 90 95	
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Ser	Ala	Val	Leu	Ala 165	His	Met	Glu	Ala	Thr 170	Gly	Val	Arg	Leu	Asp 175	Val
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<213> Thermus aquaticus

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cgg Arg	gag Glu 465	gcg Ala	gcc Ala	gag Glu	cgc Arg	atg Met 470	gcc Ala	ttc Phe	aac Asn	atg Met	ccc Pro 475	gtc Val	cag Gln	ggc	acc Thr	1439
gcc Ala 480	gcc Ala	gac Asp	ctc Leu	atg Met	aag Lys 485	ctg Leu	gct Ala	atg Met	gtg Val	aag Lys 490	Leu	ttc Phe	ccc Pro	agg Arg	ctg Leu 495	1487

gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac gag ctg gtc Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val 500 505 510	1535
ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg ctg gcc aag Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys 515 520 525	1583
gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg gag gtg gag Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu 530 535 540	1631
gtg ggg ata ggg gag gac agg ctc tcc gcc aag gag gcg gcc gca ctg Val Gly Ile Gly Glu Asp Arg Leu Ser Ala Lys Glu Ala Ala Ala Leu 545 550 555	1679
gtg ccg cgc Val Pro Arg 560	1688
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Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly 100 105 110	
Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg 115 120 125	
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Gly 145	Glu	Glu	Arg	Leu	Leu 150	Trp	Leu	Tyr	Arg	Glu 155	Val	Glu	Arg	Pro	Leu 160
Ser	Ala	Val	Leu	Ala 165	His	Met	Glu	Ala	Thr 170	Gly	Val	Arg	Leu	Asp 175	Val
Ala	Tyr	Leu	Arg 180	Ala	Leu	Ser	Leu	Glu 185	Val	Ala	Glu	Glu	Ile 190	Ala	Arg
Leu	Glu	Ala 195	Glu	Val	Phe	Arg	Leu 200	Ala	Gly	His	Pro	Phe 205	Asn	Leu	Asn
Ser	Arg 210	Asp	Gln	Leu	Glu	Arg 215	Val	Leu	Phe	Asp	Glu 220	Leu	Gly	Leu	Pro
Ala 225	Ile	Gly	Lys	Thr	Glu 230	Lys	Thr	Gly	Lys	Arg 235	Ser	Thr	Ser	Ala	Ala 240
Val	Leu	Gly	Ala	Leu 245	Arg	Glu	Ala	His	Pro 250	Ile	Val	Glu	Lys	Ile 255	Leu
Gln	Tyr	Arg	Glu 260	Leu	Thr	Lys	Leu	Lys 265	Ser	Thr	Tyr	Ile	Asp 270	Pro	Leu
Pro	Asp	Leu 275	Ile	His	Pro	Arg	Thr 280	Gly	Arg	Leu	His	Thr 285	Arg	Phe	Asn
Gln	Thr 290	Ala	Thr	Ala	Thr	Gly 295	Arg	Leu	Ser	Ser	Ser 300	Asp	Pro	Asn	Leu
Gln 305		Ile			Arg 310						Arg	Ile	Arg	Arg	Ala 320
Phe	Ile	Ala	Glu	Glu 325	Gly	Trp	Leu	Leu	Val 330	Thr	Leu	Asp	Tyr	Ser 335	Gln
Ile	Glu	Leu	Arg 340	Val	Leu	Ala	His	Leu 345	Ser	Gly	Asp	Glu	Asn 350		Ile
Arg	Val	Phe	Gln	Glu	Gly	Arg	Asp 360	Ile	His	Thr	Glu	Thr 365		Ser	Trp
Met	Phe	Gly	Val	Pro	Arg	Glu 375	Ala	Val	Asp	Pro	Leu 380		Arg	Arg	Ala

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg 385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile 405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys 420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly 435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg 450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala 465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu 485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu 500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu 515 520 525

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<220>

<221> CDS

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gcc Ala	ctg Leu	gag Glu	gag Glu	gcc Ala 20	ccc Pro	tgg Trp	ccc Pro	ccg Pro	ccg Pro 25	gaa Glu	gly aaa	gcc Ala	ttc Phe	gtg Val 30	ggc Gly	95	•
ttt Phe	gtg Val	ctt Leu	tcc Ser 35	cgc Arg	aag Lys	gag Glu	ccc Pro	atg Met 40	tgg Trp	gcc Ala	gat Asp	ctt Leu	ctg Leu 45	gcc Ala	ctg Leu	143	,
gcc Ala	gcc Ala	gcc Ala 50	agg Arg	Gly 999	ggc Gly	cgg Arg	gtc Val 55	cac His	cgg Arg	gcc Ala	ccc Pro	gag Glu 60	cct Pro	tat Tyr	aaa Lys	191	•
gcc Ala	ctc Leu 65	agg Arg	gac Asp	ctg Leu	aag Lys	gag Glu 70	gcg Ala	cgg Arg	Gly ggg	ctt Leu	ctc Leu 75	gcc Ala	aaa Lys	gac Asp	ctg Leu	239)
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Gly 999	gtg Val	gcc Ala	cgg Arg 115	cgc Arg	tac Tyr	ggc Gly	gly ggg	gag Glu 120	tgg Trp	acg Thr	gag Glu	gag Glu	gcg Ala 125	Gly aaa	gag Glu	383	3
cgg Arg	gcc Ala	gcc Ala 130	ctt Leu	tcc Ser	gag Glu	agg Arg	ctc Leu 135	ttc Phe	gcc Ala	aac Asn	ctg Leu	tgg Trp 140	Gly aaa	agg Arg	ctt Leu	435	1
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ctt Leu 160	tcc Ser	gct Ala	gtc Val	ctg Leu	gcc Ala 165	cac His	atg Met	gag Glu	gcc Ala	acg Thr 170	gly aaa	gtg Val	cgc Arg	ctg Leu	gac Asp 175	52	7
gtg Val	gcc Ala	tat Tyr	ctc Leu	agg Arg 180	gcc Ala	ttg Leu	tcc Ser	ctg Leu	gag Glu 185	Val	gcc Ala	gag Glu	gag Glu	atc Ile 190	Ala	57!	5
cgc Arg	ctc Leu	gag Glu	gcc Ala 195	gag Glu	gtc Val	ttc Phe	cgc Arg	ctg Leu 200	gcc Ala	ggc Gly	cac His	ccc Pro	ttc Phe 205	Gln	ctc Leu	62	3
aac Asn	caa Gln	cgg Arg 210	gac Asp	cag Gln	ctg Leu	gaa Glu	agg Arg 215	gtc Val	ctc Leu	ttt Phe	gac Asp	gag Glu 220	Leu	Gly Ggg	ctt Leu	67	1
ccc Pro	gcc Ala 225	atc Ile	ggc	aag Lys	acg Thr	gag Glu 230	aag Lys	acc Thr	ggc	aag Lys	cgc Arg 235	Ser	acc Thr	ago Ser	gcc Ala	71	9
gcc Ala 240	gtc Val	ctg Leu	gag Glu	gcc Ala	ctc Leu 245	cgc Arg	gag Glu	gcc Ala	cac His	Pro 250) Ile	gtg Val	gag Glu	ı aagı Lys	atc Ile 255	76	7

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ctc Leu	cag Gln 305	aac Asn	atc Ile	ccc Pro	gtc Val	cgc Arg 310	acc Thr	ccg Pro	ctt Leu	gly aaa	cag Gln 315	agg Arg	atc Ile	cgc Arg	cgg Arg	959
acc Thr 320	ttc Phe	atc Ile	gcc Ala	gag Glu	gag Glu 325	Gly ggg	agg Arg	cta Leu	ttg Leu	gtg Val 330	gcc Ala	ctg Leu	gac Asp	tat Tyr	aac Asn 335	1007
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cgc Arg 400	ctc Leu	tcc Ser	cag Gln	gag Glu	cta Leu 405	gcc Ala	atc Ile	cct Pro	tac Tyr	gag Glu 410	gag Glu	gcc Ala	cag Gln	gcc Ala	ttc Phe 415	1247
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gcc Ala 480	gcc Ala	gac Asp	ctc Leu	atg Met	aag Lys 485	ctg Leu	gct Ala	atg Met	gtg Val	aag Lys 490	Leu	ttc Phe	ccc Pro	ago Arg	ctg Leu 495	1487

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Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro 85 90 95	
Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly 100 105 110	
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Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu	

130 135 140

Gly 145	Glu	Glu	Arg	Leu	Leu 150	Trp	Leu	Tyr	Arg	Glu 155	Val	Glu	Arg	Pro	Leu 160
Ser	Ala	Val	Leu	Ala 165	His	Met	Glu	Ala	Thr 170	Gly	Val	Arg	Leu	Asp 175	Val
Ala	Tyr	Leu	Arg 180	Ala	Leu	Ser	Leu	Glu 185	Val	Ala	Glu	Glu	Ile 190	Ala	Arg
Leu	Glu	Ala 195	Glu	Val	Phe	Arg	Leu 200	Ala	Gly	His	Pro	Phe 205	Gln	Leu	Asn
Gln	Arg 210	Asp	Gln	Leu	Glu	Arg 215	Val	Leu	Phe	Asp	Glu 220	Leu	Gly	Leu	Pro
Ala 225	Ile	Gly	Lys	Thr	Glu 230	Lys	Thr	Gly	Lys	Arg 235	Ser	Thr	Ser	Ala	Ala 240
Val	Leu	Glu	Ala	Leu 245	Arg	Glu	Ala	His	Pro 250	Ile	Val	Glu	Lys	Ile 255	Leu
Gln	Tyr	Arg	Glu 260	Leu	Asn	Lys	Leu	Lys 265	Ser	Thr	Gln	Ile	Thr 270	Gln	Leu
Pro	Asp	Leu 275	Ile	His	Pro	Arg	Thr 280	Gly	Arg	Leu	His	Thr 285	Arg	Phe	Asn
Gln	Thr 290	Ala	Thr	Gln	Thr	Gly 295	Arg	Leu	Ser	Ser	Ser 300	Gln	Pro	Asn	Leu
Gln 305	Asn	Ile	Pro	Val	Arg 310	Thr	Pro	Leu	Gly	Gln 315	Arg	Ile	Arg	Arg	Thr 320
Phe	Ile	Ala	Glu	Glu 325	Gly	Arg	Leu	Leu	Val 330	Ala	Leu	Asp	Tyr	Asn 335	Gln
Ile	Glu	Leu	Arg 340	Val	Leu	Ala	His	Leu 345	Ser	Gly	Asp	Glu	. Asn 350		Ile
Arg	Val	Phe 355	Gln	Glu	Gly	Arg	Asp 360	Ile	His	Thr	Glu	Thr		Ser	Trp
Met	Phe	-	Val	Pro	Arg	Glu 375	Ala	Val	Asp	Pro	Leu 380		. Arg	Arg	Ala

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg 395 Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile 410 Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys 425 Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly 435 Arg Arg Arg Tyr Leu Pro Asp Leu Glu Ala Gln Val Lys Asn Val Arg 450 455 Glu Ala Ala Glu Arg Arg Ala Phe Asn Met Pro Val Gln Gly Thr Ala 470 465 Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu 490 485 Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu 505 500 Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu 520 515 Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val 535 530 Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val 555 550 Pro Arg <210> 25 <211> 1688 <212> DNA <213> Thermus aquaticus <220> <221> CDS <222> (3)..(1688)

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gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag cct tat aaa Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys 50 55 60	191
gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu 65 70 75	239
agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp 80 85 90 95	287
ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc acc ccc gag Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu 100 105 110	335
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gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro 145 150 155	479
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ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gcc Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala 225 230 235	719
gee gte etg gag gee ete ege gag gee eac eec ate gtg gag aag ate	767

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gcc Ala	gcc Ala	gac Asp	ctc Leu	atg Met	aag Lys	ctg Leu	gct Ala	atg Met	gtg Val	aag Lys	ctc Leu	ttc Phe	ccc Pro	agg Arg	ctg Leu	1487

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ctc gag gcc cca aaa Leu Glu Ala Pro Lys 515	gag agg gcg gag gcc Glu Arg Ala Glu Ala 520	gtg gcc cgg ctg gcc Val Ala Arg Leu Ala 525	aag 1583 Lys
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Ala Ala Arg Gly Gly 50	Arg Val His Arg Ala 55	Pro Glu Pro Tyr Lys 60	s Ala
Leu Arg Asp Leu Lys	Glu Ala Arg Gly Leu 70	Leu Ala Lys Asp Let 75	1 Ser 80
Val Leu Ala Leu Arg 85	g Glu Gly Leu Gly Leu 90	Pro Pro Gly Asp Asp 95	p Pro
Met Leu Leu Ala Tyr 100	Leu Leu Asp Pro Ser 105	Asn Thr Thr Pro Glu	ı Gly
Val Ala Arg Arg Tyr 115	Gly Gly Glu Trp Thi	Glu Glu Ala Gly Gl 125	ı Arg

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala 370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg 385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile 405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys 420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly 435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg 450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala 465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu 485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu 500 505 510

Glu Ala Pro Lys Glu Arg Ala Glu Ala Val Ala Arg Leu Ala Lys Glu 515 520 525

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<213> Thermus aquaticus

<220>

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<222> (3)..(1688)

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999 Gly	gtg Val	gcc Ala	cgg Arg 115	cgc Arg	tac Tyr	ggc Gly	gly aaa	gag Glu 120	tgg Trp	acg Thr	gag Glu	gag Glu	gcg Ala 125	Gly 999	gag Glu	383
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gta	gtc	ctg	gag	gcc	ctc	cgc	gag	gcc	cac	ccc	atc	gtg	gag	aag	, atc	767

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	gcc Ala	gcc Ala	gac Asp	ctc Leu	atg Met	aag Lys	ctg Leu	gct Ala	atg Met	gtg Val	aag Lys	ctc Leu	tcc Ser	ccc Pro	agg Arg	ctg Leu	1487

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ctc gag gcc cca aaa Leu Glu Ala Pro Lys 515	a gag ggg gcg gag s Glu Gly Ala Glu 520	gcc gtg gcc cgg ctg Ala Val Ala Arg Leu 525	gcc aag 1583 Ala Lys
gag gtc atg gag ggg Glu Val Met Glu Gly 530	g gtg tat ccc ctg Val Tyr Pro Leu 535	gcc gtg ccc ctg gag Ala Val Pro Leu Glu 540	gtg gag 1631 Val Glu
gtg ggg ata ggg gag Val Gly Ile Gly Glu 545	g gac cgg ctc tcc n Asp Arg Leu Ser 550	gcc aag gag gcg gcc Ala Lys Glu Ala Ala 555	gca ctg 1679 Ala Leu
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Ala Ala Arg Gly Gly	y Arg Val His Arg 55	Ala Pro Glu Pro Tyr 60	Lys Ala
Leu Arg Asp Leu Ly: 65	s Glu Ala Arg Gly 70	Leu Leu Ala Lys Asp 75	Leu Ser 80
Val Leu Ala Leu Arg 85	g Glu Gly Leu Gly	Leu Pro Pro Gly Asp	Asp Pro 95
Met Leu Leu Ala Ty: 100	r Leu Leu Asp Pro 105	Ser Asn Thr Thr Pro	Glu Gly
Val Ala Arg Arg Ty: 115	r Gly Gly Glu Trp 120	Thr Glu Glu Ala Gly 125	Glu Arg

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Val Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala 370 375 380

Ala Lys Ser Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg 385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile 405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys 420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly 435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg 450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala 465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Ser Pro Arg Leu Glu 485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu 500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu 515 520 525

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Gly Ile Gly Glu Asp Arg Leu Ser Ala Lys Glu Ala Ala Ala Leu Val 545 550 555 560

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<213> Thermus aquaticus

<220>

<221> CDS

<222> (3)..(1688)

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gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu 65 70 75	239
agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp 80 85 90 95	287
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cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg ggg agg ctt Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu 130 135 140	431
gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro 145 150 155	479
ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg cgc ctg gac Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp 160 165 170 175	527
gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag gag atc gcc Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala 180 185 190	575
cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc ttc aac ctc Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu 195 200 205	623
aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag cta ggg cttAsn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu210215	671
CCC gCC atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gccPro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala225230	719
ged gtd ctg gag ged etc ege gag ged cac eec atc gtg gag aag atc	767

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														cgc Arg		959
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cag Gln	ata Ile	gag Glu	ctc Leu	agg Arg 340	gtg Val	ctg Leu	gcc Ala	cac His	ctc Leu 345	tcc Ser	ggc Gly	gac Asp	gag Glu	aac Asn 350	ctg Leu	1055
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Ala Ala Arg Gly (50	Bly Arg Val His 55	Arg Ala Pro Glu Pro 60	Tyr Lys Ala
Leu Arg Asp Leu 1 65	Lys Glu Ala Arg 70	Gly Leu Leu Ala Lys 75	Asp Leu Ser 80
	Arg Glu Gly Leu 35	Gly Leu Pro Pro Gly 90	Asp Asp Pro 95
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Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn Gln Thr Val Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala 370 375 380

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Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu 485 490 495

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Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu 515 520 525

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ccc Pro	gcc Ala 225	atc Ile	ggc Gly	aag Lys	acg Thr	gag Glu 230	aag Lys	acc Thr	ggc	aag Lys	cgc Arg 235	tcc Ser	acc Thr	agc Ser	gcc Ala	719
gcc	gtc	ctg	gag	gcc	ctc	cgc	gag	gcc	cac	ccc	atc	gtg	gag	aag	atc	767

Ala 240	Val	Leu	Glu	Ala	Leu 245	Arg	Glu	Ala	His	Pro 250	Ile	Val	Glu	Lys	Ile 255	
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ttg Leu	ccg Pro	gac Asp	ctc Leu 275	atc Ile	cac His	ccc Pro	agg Arg	acg Thr 280	ggc Gly	cgc Arg	ctc Leu	cac His	acc Thr 285	cgc Arg	ttc Phe	863
aac Asn	cag Gln	acg Thr 290	gcc Ala	acg Thr	gcc Ala	acg Thr	ggc Gly 295	agg Arg	cta Leu	agt Ser	agc Ser	tcc Ser 300	gat Asp	ccc Pro	aac Asn	911
ctc Leu	cag Gln 305	aac Asn	atc Ile	ccc Pro	gtc Val	cgc Arg 310	acc Thr	ccg Pro	ctt Leu	gly ggg	cag Gln 315	agg Arg	atc Ile	cgc Arg	cgg Arg	959
gcc Ala 320	ttc Phe	atc Ile	gcc Ala	gag Glu	gag Glu 325	gjà aaa	tgg Trp	cta Leu	ttg Leu	gtg Val 330	gcc Ala	ctg Leu	gac Asp	tat Tyr	agc Ser 335	1007
cag Gln	ata Ile	gag Glu	ctc Leu	agg Arg 340	gtg Val	ctg Leu	gcc Ala	cac His	ctc Leu 345	tcc Ser	ggc Gly	gac Asp	gag Glu	aac Asn 350	ctg Leu	1055
atc Ile	cgg Arg	gtc Val	ttc Phe 355	cag Gln	gag Glu	Gly aaa	cgg Arg	gac Asp 360	atc Ile	cac His	acg Thr	gag Glu	acc Thr 365	gcc Ala	agc Ser	1103
tgg Trp	atg Met	ttc Phe 370	ggc Gly	gtc Val	ccc Pro	cgg Arg	gag Glu 375	gcc Ala	gtg Val	gac Asp	ccc Pro	ctg Leu 380	atg Met	cgc Arg	cgg Arg	1151
gcg Ala	gcc Ala 385	aag Lys	acc Thr	atc Ile	aac Asn	ttc Phe 390	Gly 999	gtc Val	ctc Leu	tac Tyr	ggc Gly 395	atg Met	tcg Ser	gcc Ala	cac His	1199
Arg	ctc Leu	Ser	Gln	Glu	cta Leu 405	Ala	atc Ile	cct Pro	tac Tyr	gag Glu 410	gag Glu	gcc Ala	cag Gln	gcc Ala	ttc Phe 415	1247
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aag Lys	acc Thr	ctg Leu	gag Glu 435	gag Glu	ggc Gly	agg Arg	agg Arg	cgg Arg 440	Gl ^y aaa	tac Tyr	gtg Val	gag Glu	acc Thr 445	ctc Leu	ttc Phe	1343
ggc Gly	cgc Arg	cgc Arg 450	cgc Arg	tac Tyr	gtg Val	cca Pro	gac Asp 455	cta Leu	gag Glu	gcc Ala	cgg Arg	gtg Val 460	aag Lys	agc Ser	gtg Val	1391
cgg Arg	gag Glu 465	gcg Ala	gcc Ala	gag Glu	cgc Arg	atg Met 470	gcc Ala	ttc Phe	aac Asn	atg Met	ccc Pro 475	gtc Val	cag Gln	ggc	acc Thr	1439
gcc Ala	gcc Ala	gac Asp	ctc Leu	atg Met	aag Lys	ctg Leu	gct Ala	atg Met	gtg Val	aag Lys	ctc Leu	ttc Phe	ccc Pro	agg Arg	ctg Leu	1487

480	485	490	495
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ctc gag gcc cca aa Leu Glu Ala Pro Ly 515	a gag ggg gcg gag s Glu Gly Ala Glu 520	gcc gtg gcc cgg ctg Ala Val Ala Arg Leu 525	gcc aag 1583 Ala Lys
gag gtc atg gag gg Glu Val Met Glu Gl 530	g gtg tat ccc ctg y Val Tyr Pro Leu 535	gcc gtg ccc ctg gag Ala Val Pro Leu Glu 540	gtg gag 1631 Val Glu
gtg ggg ata ggg ga Val Gly Ile Gly Gl 545	g gac cgg ctc tcc u Asp Arg Leu Ser 550	gcc aag gag gcg gcc Ala Lys Glu Ala Ala 555	gca ctg 1679 Ala Leu
gtg ccg cgc Val Pro Arg 560			1688
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Val Leu Ser Arg Ly 35	rs Glu Pro Met Trp 40	Ala Asp Leu Leu Ala 45	Leu Ala
Ala Ala Arg Gly G. 50	y Arg Val His Arg 55	g Ala Pro Glu Pro Tyr 60	Lys Ala
Leu Arg Asp Leu Ly 65	rs Glu Ala Arg Gly 70	/ Leu Leu Ala Lys Asp 75	Leu Ser 80
Val Leu Ala Leu A: 8!		Leu Pro Pro Gly Asp 90	Asp Pro 95
Met Leu Leu Ala Ty 100	r Leu Leu Asp Pro 109	Ser Asn Thr Thr Pro	Glu Gly
Val Ala Arg Årg Ty 115	rr Gly Gly Glu Trp 120	o Thr Glu Glu Ala Gly 125	Glu Arg

Ala	Ala 130	Leu	Ser	Glu	Arg	Leu 135	Phe	Ala	Asn	Leu	Trp 140	Gly	Arg	Leu	Glu
Gly 145	Glu	Glu	Arg	Leu	Leu 150	Trp	Leu	Tyr	Arg	Glu 155	Val	Glu	Arg	Pro	Leu 160
Ser	Ala	Val	Leu	Ala 165	His	Met	Glu	Ala	Thr 170	Gly	Val	Arg	Leu	Asp 175	Val
Ala	Tyr	Leu	Arg 180	Ala	Leu	Ser	Leu	Glu 185	Val	Ala	Glu	Glu	Ile 190	Ala	Arg
Leu	Glu	Ala 195	Glu	Val	Phe	Arg	Leu 200	Ala	Gly	His	Pro	Phe 205	Asn	Leu	Asn
Ser	Arg 210	Asp	Gln	Leu	Glu	Arg 215	Val	Leu	Phe	Asp	Glu 220	Leu	Gly	Leu	Pro
Ala 225	Ile	Gly	Lys	Thr	Glu 230	Lys	Thr	Gly	Lys	Arg 235	Ser	Thr	Ser	Ala	Ala 240
Val	Leu	Glu	Ala	Leu 245	Arg	Glu	Ala	His	Pro 250	Ile	Val	Glu	Lys	Ile 255	Leu
Gln	Tyr	Arg	Glu 260	Leu	Thr	Lys	Leu	Lys 265	Ser	Thr	Tyr	Ile	Asp 270	Pro	Leu
Pro	Asp	Leu 275	Ile	His	Pro	Arg	Thr 280	Gly	Arg	Leu	His	Thr 285	Arg	Phe	Asn
Gln	Thr 290	Ala	Thr	Ala	Thr	Gly 295	Arg	Leu	Ser	Ser	Ser 300	Asp	Pro	Asn	Leu
Gln 305	Asn	Ile	Pro	Val	Arg 310	Thr	Pro	Leu	Gly	Gln 315	Arg	Ile	Arg	Arg	Ala 320
Phe	Ile	Ala	Glu	Glu 325	Gly	Trp	Leu	Leu	Val 330	Ala	Leu	Asp	Tyr	Ser 335	Gln
Ile	Glu	Leu	Arg 340	Val	Leu	Ala	His	Leu 345	Ser	Gly	Asp	Glu	Asn 350	Leu	Ile
Arg	Val	Phe 355	Gln	Glu	Gly	Arg	Asp 360	Ile	His	Thr	Glu	Thr 365		Ser	Trp
Met	Phe	Gly	Val	Pro	Arg	Glu	Ala	Val	Asp	Pro	Leu	Met	Arg	Arg	Ala

370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg 385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile 405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys 420 425 430

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg 450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala 465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu 485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu 500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu 515 520 525

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Pro Arg

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<220>

<221> CDS

<222> (3)..(1688)

<400> 33

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ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt ctg gcc ctg Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu 35 40 45	143
gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag cct tat aaa Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys 50 55 60	191
gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu 65 70 75	239
agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp 80 85 90 95	287
ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc acc ccc gag Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu 100 105 110	335
ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag gcg ggg gag Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu 115 120 125	383
cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg ggg agg ctt Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu 130 135 140	431
gag ggg gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro 145 150 155	479
ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg cgc ctg gac Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp 160 165 170 175	527
gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag gag atc gcc Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala 180 185 190	575
cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc ttc aac ctc Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu 195 200 205	623
aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag cta ggg ctt Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu 210 215 220	671
ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gcc Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala 225 230 235	719
gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg gag aag atc	767

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ctg Leu	cag Gln	tac Tyr	cgg Arg	gag Glu 260	ctc Leu	acc Thr	aag Lys	ctg Leu	aag Lys 265	agc Ser	acc Thr	tac Tyr	att Ile	gac Asp 270	ccc Pro	8	315
ttg Leu	ccg Pro	gac Asp	ctc Leu 275	atc Ile	cac His	ccc Pro	agg Arg	acg Thr 280	ggc Gly	cgc Arg	ctc Leu	cac His	acc Thr 285	cgc Arg	ttc Phe	8	363
aac Asn	cag Gln	acg Thr 290	gcc Ala	acg Thr	gcc Ala	acg Thr	ggc Gly 295	agg Arg	cta Leu	agt Ser	agc Ser	tcc Ser 300	gat Asp	ccc Pro	aac Asn	9	911
ctc Leu	cag Gln 305	aac Asn	atc Ile	ccc Pro	gtc Val	cgc Arg 310	acc Thr	ccg Pro	ctt Leu	Gl ^A aaa	cag Gln 315	agg Arg	atc Ile	cgc Arg	cgg Arg	9	959
gcc Ala 320	ttc Phe	atc Ile	gcc Ala	gag Glu	gag Glu 325	Gly 333	tgg Trp	cta Leu	ttg Leu	gtg Val 330	gcc Ala	ctg Leu	gac Asp	tat Tyr	agc Ser 335	10	007
cag Gln	ata Ile	gag Glu	ctc Leu	agg Arg 340	gtg Val	ctg Leu	gcc Ala	cac His	ctc Leu 345	tcc Ser	ggc Gly	gac Asp	gag Glu	aac Asn 350	ctg Leu	1	055
atc Ile	cgg Arg	gtc Val	ttc Phe 355	cag Gln	gag Glu	Gly 999	cgg Arg	gac Asp 360	atc Ile	cac His	acg Thr	gag Glu	acc Thr 365	gcc Ala	agc Ser	1	103
tgg Trp	atg Met	ttc Phe 370	ggc Gly	gtc Val	ccc Pro	cgg Arg	gag Glu 375	gcc Ala	gtg Val	gac Asp	ccc Pro	ctg Leu 380	atg Met	cgc Arg	cgg Arg	1	151
gcg Ala	gcc Ala 385	aag Lys	acc Thr	atc Ile	aac Asn	ttc Phe 390	Gly 999	gtc Val	ctc Leu	tac Tyr	ggc Gly 395	atg Met	tcg Ser	gcc Ala	cac His	1	199
Arg	ctc Leu	tcc Ser	cag Gln	gag Glu	cta Leu 405	Ala	atc Ile	cct Pro	tac Tyr	gag Glu 410	gag Glu	gcc Ala	cag Gln	gcc Ala	ttc Phe 415	1	247
att Ile	gag Glu	cgc Arg	tac Tyr	ttt Phe 420	ctg Leu	agc Ser	ttc Phe	ccc Pro	aag Lys 425	gtg Val	cgg Arg	gcc Ala	tgg Trp	att Ile 430	gag Glu	1	295
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cgg Arg	gag Glu 465	Ala	gcc Ala	gag Glu	cgc Arg	aag Lys 470	gcc Ala	ttc Phe	aac Asn	atg Met	ccc Pro 475	Val	cag Glr	ggg Gly	acc Thr	1	439
gcc Ala	gcc Ala	gac Asp	ctc Leu	atg Met	aag Lys	ctg Leu	gct Ala	atg Met	gtg Val	aag Lys	ctc Leu	ttc Phe	c ccc Pro	agg Arg	ctg Leu	1	L487

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ctc gag gcc cca aaa Leu Glu Ala Pro Lys 515	a gag ggg gcg gag s Glu Gly Ala Glu 520	gcc gtg gcc cgg ctg Ala Val Ala Arg Leu 525	gcc aag 1583 Ala Lys
gag gtc atg gag ggg Glu Val Met Glu Gly 530	g gtg tat ccc ctg / Val Tyr Pro Leu 535	gcc gtg ctc ctg gag Ala Val Leu Leu Glu 540	gtg gag 1631 Val Glu
gtg ggg ata ggg gag Val Gly Ile Gly Gly 545	g gac tgg ctc tcc 1 Asp Trp Leu Ser 550	gcc aag gag gcg gcc Ala Lys Glu Ala Ala 555	gca ctg 1679 Ala Leu
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Val Leu Ser Arg Ly: 35	s Glu Pro Met Trp 40	Ala Asp Leu Leu Ala 45	Leu Ala
Ala Ala Arg Gly Gly	y Arg Val His Arg 55	Ala Pro Glu Pro Tyr 60	Lys Ala
Leu Arg Asp Leu Ly 65	s Glu Ala Arg Gly 70	Leu Leu Ala Lys Asp 75	Leu Ser 80
Val Leu Ala Leu Ar 85	g Glu Gly Leu Gly	Leu Pro Pro Gly Asp	Asp Pro 95
Met Leu Leu Ala Ty 100	r Leu Leu Asp Pro 105	Ser Asn Thr Thr Pro	Glu Gly
Val Ala Arg Arg Ty	r Gly Gly Glu Trp 120	Thr Glu Glu Ala Gly 125	Glu Arg

Ala	Ala	Leu	Ser	Glu	Arg	Leu	Phe	Ala	Asn	Leu	Trp	Gly	Arg	Leu	Glu
	130					135					140				
Gly 145	Glu	Glu	Arg	Leu	Leu 150	Trp	Leu	Tyr	Arg	Glu 155	Val	Glu	Arg	Pro	Leu 160
Ser	Ala	Val	Leu	Ala 165	His	Met	Glu	Ala	Thr 170	Gly	Val	Arg	Leu	Asp 175	Val
Ala	Tyr	Leu	Arg 180	Ala	Leu	Ser	Leu	Glu 185	Val	Ala	Glu	Glu	Ile 190	Ala	Arg
Leu	Glu	Ala 195	Glu	Val	Phe	Arg	Leu 200	Ala	Gly	His	Pro	Phe 205	Asn	Leu	Asn
Ser	Arg 210	Asp	Gln	Leu	Glu	Arg 215	Val	Leu	Phe	Asp	Glu 220	Leu	Gly	Leu	Pro
Ala 225	Ile	Gly	Lys	Thr	Glu 230	Lys	Thr	Gly	Lys	Arg 235	Ser	Thr	Ser	Ala	Ala 240
Val	Leu	Glu	Ala	Leu 245	Arg	Glu	Ala	His	Pro 250	Ile	Val	Glu	Lys	Ile 255	Leu
Gln	Tyr	Arg	Glu 260	Leu	Thr	Lys	Leu	Lys 265	Ser	Thr	Tyr	Ile	Asp 270	Pro	Leu
Pro	Asp	Leu 275	Ile	His	Pro	Arg	Thr 280	Gly	Arg	Leu	His	Thr 285	Arg	Phe	Asn
Gln	Thr 290	Ala	Thr	Ala	Thr	Gly 295	Arg	Leu	Ser	Ser	Ser 300	Asp	Pro	Asn	Leu
Gln 305	Asn	Ile	Pro	Val	Arg 310	Thr	Pro	Leu	Gly	Gln 315	Arg	Ile	Arg	Arg	Ala 320
Phe	Ile	Ala	Glu	Glu 325	Gly	Trp	Leu	Leu	Val 330	Ala	Leu	Asp	Tyr	Ser 335	Gln
Ile	Glu	Leu	Arg 340	Val	Leu	Ala	His	Leu 345	Ser	Gly	Asp	Glu	Asn 350	Leu	Ile
Arg	Val	Phe	Gln	Glu	Gly	Arg	Asp 360	Ile	His	Thr	Glu	Thr 365		Ser	Trp

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala 375 Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg 395 Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile 410 Glu Arg Tyr Phe Leu Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys 425 Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly 435 Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg 455 450 Glu Ala Ala Glu Arg Lys Ala Phe Asn Met Pro Val Gln Gly Thr Ala 475 470 465 Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu 485 490 Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu 500 Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu 525 520 515 Val Met Glu Gly Val Tyr Pro Leu Ala Val Leu Leu Glu Val Glu Val 535 530 Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val 555 550 545 Pro Arg

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gcc Ala	ctg Leu	gag Glu	gag Glu	gcc Ala 20	ccc Pro	tgg Trp	ccc Pro	ccg Pro	ccg Pro 25	gaa Glu	gly aaa	gcc Ala	ttc Phe	gtg Val 30	ggc Gly	95
ttt Phe	gtg Val	ctt Leu	tcc Ser 35	cgc Arg	aag Lys	gag Glu	ccc Pro	atg Met 40	tgg Trp	gcc Ala	gat Asp	ctt Leu	ctg Leu 45	gcc Ala	ctg Leu	143
gcc Ala	gcc Ala	gcc Ala 50	agg Arg	Gl ^A aaa	ggc Gly	cgg Arg	gtc Val 55	cac His	cgg Arg	gcc Ala	ccc Pro	gag Glu 60	cct Pro	tat Tyr	aaa Lys	191
gcc Ala	ctc Leu 65	agg Arg	gac Asp	ctg Leu	aag Lys	gag Glu 70	gcg Ala	cgg Arg	Gly 999	ctt Leu	ctc Leu 75	gcc Ala	aaa Lys	gac Asp	ctg Leu	239
agc Ser 80	gtt Val	ctg Leu	gcc Ala	ctg Leu	agg Arg 85	gaa Glu	ggc Gly	ctt Leu	ggc Gly	ctc Leu 90	ccg Pro	ccc Pro	ggc Gly	gac Asp	gac Asp 95	287
ccc Pro	atg Met	ctc Leu	ctc Leu	gcc Ala 100	tac Tyr	ctc Leu	ctg Leu	gac Asp	cct Pro 105	tcc Ser	aac Asn	acc Thr	acc Thr	ccc Pro 110	gag Glu	335
gly ggg	gtg Val	gcc Ala	cgg Arg 115	cgc Arg	tac Tyr	ggc Gly	Gly aaa	gag Glu 120	tgg Trp	acg Thr	gag Glu	gag Glu	gcg Ala 125	Gly 999	gag Glu	383
cgg Arg	gcc Ala	gcc Ala 130	ctt Leu	tcc Ser	gag Glu	agg Arg	ctc Leu 135	ttc Phe	gcc Ala	aac Asn	ctg Leu	tgg Trp 140	Gly 999	agg Arg	ctt Leu	431
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ctt Leu 160	tcc Ser	gct Ala	gtc Val	ctg Leu	gcc Ala 165	cac His	atg Met	gag Glu	gcc Ala	acg Thr 170	gly aaa	gtg Val	cgc Arg	ctg Leu	gac Asp 175	527
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cgc Arg	ctc Leu	gag Glu	gcc Ala 195	gag Glu	gtc Val	ttc Phe	cgc Arg	ctg Leu 200	Ala	ggc Gly	cac His	ccc Pro	ttc Phe 205	Asn	ctc Leu	623
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ccc Pro	gcc Ala 225	Ile	ggc Gly	aag Lys	acg Thr	gag Glu 230	Lys	acc Thr	ggc	aag Lys	cgc Arg 235	Ser	acc Thr	ago Ser	gcc Ala	719

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ctg Leu	cag Gln	tac Tyr	cgg Arg	gag Glu 260	ctc Leu	acc Thr	aag Lys	ctg Leu	aag Lys 265	agc Ser	acc Thr	tac Tyr	att Ile	gac Asp 270	ccc Pro	815
ttg Leu	cag Gln	gac Asp	ctc Leu 275	atc Ile	cac His	ccc Pro	agt Ser	acg Thr 280	ggc Gly	cgc Arg	ctc Leu	cac His	acc Thr 285	cgc Arg	ttc Phe	863
aac Asn	cag Gln	acg Thr 290	gcc Ala	acg Thr	gcc Ala	acg Thr	ggc Gly 295	agg Arg	cta Leu	agt Ser	agc Ser	tcc Ser 300	gat Asp	ccc Pro	aac Asn	911
ctc Leu	cag Gln 305	aac Asn	atc Ile	ccc Pro	gtc Val	cgc Arg 310	acc Thr	ccg Pro	ctt Leu	Gly aaa	cag Gln 315	agg Arg	atc Ile	cgc Arg	cgg Arg	959
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cag Gln	ata Ile	gag Glu	ctc Leu	agg Arg 340	gtg Val	ctg Leu	gcc Ala	cac His	ctc Leu 345	tcc Ser	ggc Gly	gac Asp	gag Glu	aac Asn 350	ctg Leu	1055
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tgg Trp	atg Met	ttc Phe 370	ggc Gly	gtc Val	ccc Pro	cgg Arg	gag Glu 375	gcc Ala	gtg Val	gac Asp	ccc Pro	ctg Leu 380	atg Met	cgc Arg	cgg Arg	1151
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att Ile	gag Glu	cgc Arg	tac Tyr	ttt Phe 420	cag Gln	agc Ser	ttc Phe	ccc Pro	aag Lys 425	gtg Val	cgg Arg	gcc Ala	tgg Trp	att Ile 430	gag Glu	1295
aag Lys	acc Thr	cta Leu	gag Glu 435	gag Glu	ggc Gly	agg Arg	agg Arg	cgg Arg 440	gly aaa	tac Tyr	gtg Val	gag Glu	acc Thr 445	Leu	ttc Phe	1343
ggc Gly	cgc Arg	cgc Arg 450	cgc Arg	tac Tyr	gtg Val	cca Pro	gac Asp 455	cta Leu	gag Glu	gcc Ala	cgg Arg	gtg Val 460	Lys	ago Ser	gag Glu	1391
cgg Arg	gag Glu 465	gcg Ala	gcc Ala	gag Glu	cgc Arg	atg Met 470	gcc Ala	tac Tyr	aac Asn	atg Met	ccc Prc 475	val	cag Gln	ggc	acc Thr	1439
gcc	gcc	gac	ctc	atg	aag	ctg	gct	atg	gtg	aag	ctc	ttc	ccc	agg	g ctg	1487

Ala Ala Asp Le 480	eu Met Lys 485	Leu Ala	Met Val	Lys Leu 490	Phe Pro	Arg l	Leu 495
gag gaa atg g Glu Glu Met G	gg gcc cgg ly Ala Arg 500	atg ctc Met Leu	ctt cag Leu Gln 505	gtc cac Val His	gac gag Asp Glu	ctg of Leu '	gtc 1535 Val
ctc gag gcc co Leu Glu Ala P:	ca aaa gag ro Lys Glu 15	ggg gcg Gly Ala	gag gcc Glu Ala 520	gtg gcc Val Ala	cgg ctg Arg Leu 525	gcc Ala	aag 1583 Lys
gag gtc atg g Glu Val Met G 530	ag ggg gtg lu Gly Val	tat ccc Tyr Pro 535	ctg gcc Leu Ala	gtg ccc Val Pro	ctg gag Leu Glu 540	gcg (gag 1631 Glu
gtg ggg ata g Val Gly Ile G 545	gg gag gat ly Glu Asp	tgg ctc Trp Leu 550	tcc gcc Ser Ala	aag gag Lys Glu 555	gcg gcc Ala Ala	gca Ala	ctg 1679 Leu
gtg ccg cgc Val Pro Arg 560							1688
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Val Leu Ser A 35	arg Lys Glu	Pro Met	Trp Ala	Asp Leu	Leu Ala 45	Leu	Ala
Ala Ala Arg G 50	sly Gly Arg	Val His 55	Arg Ala	Pro Glu 60	Pro Tyr	Lys	Ala
Leu Arg Asp L 65	Leu Lys Glu 70	Ala Arg	Gly Leu	Leu Ala 75	Lys Asp	Leu	Ser 80
Val Leu Ala L	Leu Arg Glu 85	Gly Leu	. Gly Let 90	ı Pro Pro	Gly Asp	Asp 95	Pro
Met Leu Leu A	ala Tyr Leu 100	Leu Asp	Pro Sei	Asn Thr	Thr Pro	o Glu)	Gly
Val Ala Arg A 115	Arg Tyr Gly	Gly Glu 120		c Glu Glu	Ala Gly 125	/ Glu	Arg

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu 135 Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu 155 150 Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg 185 190 180 Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn 200 Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro 210 Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala 235 240 230 Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu 245 Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu 260 Gln Asp Leu Ile His Pro Ser Thr Gly Arg Leu His Thr Arg Phe Asn 280 275 Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Asp Pro Asn Leu 295 Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala 315 310 Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln 330 325 Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile 345 340 Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp 355 360

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala 375 Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg 395 Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile 410 405 Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys 420 Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly 440 435 Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Glu Arg 455 450 Glu Ala Ala Glu Arg Met Ala Tyr Asn Met Pro Val Gln Gly Thr Ala 475 470 465 Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu 490 485 Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu 505 500 Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu 515 520 Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Ala Glu Val 535 530 Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val 555 550 Pro Arg <210> 37 <211> 1688 <212> DNA <213> Thermus aquaticus <220>

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<222> (3)..(1688)

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gcc ctg Ala Leu	gag ga Glu Gl	g gcc u Ala 20	ccc Pro	tgg Trp	ccc Pro	ccg Pro	ccg Pro 25	gaa Glu	Gly 999	gcc Ala	ttc Phe	gtg Val 30	ggc Gly	95
ttt gtg Phe Val	ctt to Leu Se 35	r Arg	aag Lys	gag Glu	ccc Pro	atg Met 40	tgg Trp	gcc Ala	gat Asp	ctt Leu	ctg Leu 45	gcc Ala	ctg Leu	143
gcc gcc Ala Ala	gcc ag Ala Ar 50	d Glà a aaa	ggc Gly	cgg Arg	gtc Val 55	cac His	cgg Arg	gcc Ala	ccc Pro	gag Glu 60	cct Pro	tat Tyr	aaa Lys	191
gcc ctc Ala Leu 65	agg ga Arg As	c ctg	aag Lys	gag Glu 70	gcg Ala	cgg Arg	Gly 999	ctt Leu	ctc Leu 75	gcc Ala	aaa Lys	gac Asp	ctg Leu	239
agc gtt Ser Val 80	ctg go Leu Al	c ctg a Leu	agg Arg 85	gaa Glu	ggc Gly	ctt Leu	ggc Gly	ctc Leu 90	ccg Pro	ccc Pro	ggc Gly	gac Asp	gac Asp 95	287
ccc atg Pro Met	ctc ct Leu Le	c gcc eu Ala 100	tac Tyr	ctc Leu	ctg Leu	gac Asp	cct Pro 105	tcc Ser	aac Asn	acc Thr	acc Thr	ccc Pro 110	gag Glu	335
ggg gtg Gly Val	gcc cg Ala Ar 11	g Arg	tac Tyr	ggc Gly	Gly aaa	gag Glu 120	tgg Trp	acg Thr	gag Glu	gag Glu	gcg Ala 125	gly gag	gag Glu	383
cgg gcc Arg Ala	gcc ct Ala Le 130	t tcc eu Ser	gag Glu	agg Arg	ctc Leu 135	ttc Phe	gcc Ala	aac Asn	ctg Leu	tgg Trp 140	gly aaa	agg Arg	ctt Leu	431
gag ggg Glu Gly 145	Glu Gl	ag agg Lu Arg	ctc Leu	ctt Leu 150	tgg Trp	ctt Leu	tac Tyr	cgg Arg	gag Glu 155	gtg Val	gag Glu	agg Arg	ccc Pro	479
ctt tcc Leu Ser 160	gct gt Ala Va	c ctg al Leu	gcc Ala 165	cac His	atg Met	gag Glu	gcc Ala	acg Thr 170	gly aaa	gtg Val	cgc Arg	ctg Leu	gac Asp 175	527
gtg gcc Val Ala	tat ct Tyr Le	c agg eu Arg 180	gcc Ala	ttg Leu	tcc Ser	ctg Leu	gag Glu 185	gtg Val	gcc Ala	gag Glu	gag Glu	atc Ile 190	gcc Ala	575
cgc ctc Arg Leu	gag go Glu Al	la Glu	gtc Val	ttc Phe	cgc Arg	ctg Leu 200	gcc Ala	ggc	cac His	ccc Pro	ttc Phe 205	aac Asn	ctc Leu	623
aac tcc Asn Ser	Arg As 210	sp Gln	Leu	Glu	Arg 215	Val	Leu	Phe	Asp	Glu 220	Leu	Gly	Leu	671
ccc gcc Pro Ala 225	Ile G	gc aag ly Lys	acg Thr	gag Glu 230	aag Lys	acc Thr	ggc	aag Lys	cgc Arg 235	tcc Ser	acc Thr	agc Ser	gcc Ala	719

gcc Ala 240	gtc Val	ctg Leu	gag Glu	gcc Ala	ctc Leu 245	cgc Arg	gag Glu	gcc Ala	cac His	ccc Pro 250	atc Ile	gtg Val	gag Glu	aag Lys	atc Ile 255	7	67
ctg Leu	cag Gln	tac Tyr	cgg Arg	gag Glu 260	ctc Leu	acc Thr	aag Lys	ctg Leu	aag Lys 265	agc Ser	acc Thr	tac Tyr	att Ile	gac Asp 270	ccc Pro	8	15
ttg Leu	ccg Pro	gac Asp	ctc Leu 275	atc Ile	cac His	ccc Pro	agg Arg	acg Thr 280	ggc Gly	cgc Arg	ctc Leu	cac His	acc Thr 285	cgc Arg	ttc Phe	8	63
aac Asn	cag Gln	acg Thr 290	gcc Ala	acg Thr	gcc Ala	acg Thr	ggc Gly 295	agg Arg	cta Leu	agt Ser	agc Ser	tcc Ser 300	gat Asp	ccc Pro	aac Asn	9	11
ctc Leu	cag Gln 305	aac Asn	atc Ile	ccc Pro	gtc Val	cgc Arg 310	acc Thr	ccg Pro	ctt Leu	Gly 999	cag Gln 315	agg Arg	atc Ile	cgc Arg	cgg Arg	9	59
gcc Ala 320	ttc Phe	atc Ile	gcc Ala	gag Glu	gag Glu 325	Gly 999	tgg Trp	cta Leu	ttg Leu	gtg Val 330	gcc Ala	ctg Leu	gac Asp	tat Tyr	agc Ser 335	10	07
cag Gln	ata Ile	gag Glu	ctc Leu	agg Arg 340	gtg Val	ctg Leu	gcc Ala	cac His	ctc Leu 345	tcc Ser	ggc Gly	gac Asp	gag Glu	aac Asn 350	ctg Leu	10)55
atc Ile	cgg Arg	gtc Val	ttc Phe 355	cag Gln	gag Glu	Glà aaa	cgg Arg	gac Asp 360	atc Ile	cac His	acg Thr	gag Glu	acc Thr 365	gcc Ala	agc Ser	11	.03
tgg Trp	atg Met	ttc Phe 370	ggc Gly	gtc Val	ccc Pro	cgg Arg	gag Glu 375	gcc Ala	gtg Val	gac Asp	ccc Pro	ctg Leu 380	atg Met	cgc Arg	cgg Arg	11	L51
gcg Ala	gcc Ala 385	aag Lys	acc Thr	atc Ile	aac Asn	ttc Phe 390	Gly aaa	gtc Val	ctc Leu	tac Tyr	ggc Gly 395	atg Met	tcg Ser	gcc Ala	cac His	11	199
cgc Arg 400	ctc Leu	tcc Ser	cag Gln	gag Glu	cta Leu 405	gcc Ala	atc Ile	cct Pro	tac Tyr	gag Glu 410	gag Glu	gcc Ala	cag Gln	gcc Ala	ttc Phe 415	12	247
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aag Lys	acc Thr	ctg Leu	gag Glu 435	gag Glu	ggc Gly	agg Arg	agg Arg	cgg Arg 440	Gly 999	tac Tyr	gtg Val	gag Glu	acc Thr 445	Leu	ttc Phe	13	343
ggc Gly	cgc Arg	cgc Arg 450	cgc Arg	tac Tyr	gtg Val	cca Pro	gac Asp 455	cta Leu	gag Glu	gcc Ala	cgg Arg	gtg Val 460	Lys	agc Ser	gtg Val	13	391
cgg Arg	gag Glu 465	gcg Ala	gcc Ala	gag Glu	cgc Arg	atg Met 470	gcc Ala	ttc Phe	aac Asn	atg Met	ccc Pro 475	gtc Val	cag Gln	ggc	acc Thr	14	439
gcc	gcc	gac	ctc	gtg	aag	ctg	gct	atg	gtg	aag	ctc	ttc	ccc	agg	ctg	1	487

Ala Ala Asp Leu Val	Lys Leu Ala M 485	Met Val Lys Leu 490	Phe Pro Arg Leu 495
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ctc gag gcc cca aaa Leu Glu Ala Pro Lys 515	Glu Gly Ala G	gag gcc gtg gcc Glu Ala Val Ala 520	cgg ctg gcc aag 1583 Arg Leu Ala Lys 525
gag gtc atg gag ggg Glu Val Met Glu Gly 530	gtg tat ccc c Val Tyr Pro I 535	ctg gcc gtg ccc Leu Ala Val Pro	ctg gag gtg gag 1631 Leu Glu Val Glu 540
gtg ggg ata ggg gag Val Gly Ile Gly Glv 545	gac tgg ctc t Asp Trp Leu S 550	ccc gcc aag gag Ser Ala Lys Glu 555	gcg gcc gca ctg 1679 Ala Ala Ala Leu
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Leu Glu Glu Ala Pro 20		Pro Glu Gly Ala 25	Phe Val Gly Phe 30
Val Leu Ser Arg Ly: 35	Glu Pro Met 5	Trp Ala Asp Leu	Leu Ala Leu Ala 45
Ala Ala Arg Gly Gly	/ Arg Val His A 55	Arg Ala Pro Glu 60	Pro Tyr Lys Ala
Leu Arg Asp Leu Ly: 65	Glu Ala Arg (70	Gly Leu Leu Ala 75	Lys Asp Leu Ser 80
Val Leu Ala Leu Arg 85	g Glu Gly Leu (Gly Leu Pro Pro 90	Gly Asp Asp Pro 95
Met Leu Leu Ala Ty:	Leu Leu Asp	Pro Ser Asn Thr	Thr Pro Glu Gly
100		105	110

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala 375 370 Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg 395 390 385 Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile 405 Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys 425 420 Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly 440 435 Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg 450 455 Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala 475 470 Ala Asp Leu Val Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu 490 485 Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu 505 500 Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu 520 515 Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val 535 530 Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val 555 550 545 Pro Arg <210> 39 <211> 12 <212> PRT <213> Artificial Sequence

<223> Description of Artificial Sequence: Synthetic peptide

<400> 39

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Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly
<210> 40
<211> 17
<212> PRT
<213> Artificial Sequence
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His
<210> 41
<211> 22
<212> PRT
<213> Artificial Sequence
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Met Lys Tyr Leu Leu Pro Thr Ala Ala Gly Leu Leu Leu Ala
Ala Gln Pro Ala Met Ala
           20
<210> 42
<211> 22
<212> PRT
<213> Artificial Sequence
<223> Description of Artificial Sequence: Synthetic peptide
<400> 42
Met Lys Thr Leu Leu Ala Met Val Leu Val Gly Leu Leu Leu Pro
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                                   10
Pro Gly Pro Ser Met Ala
          20
<210> 43
<211> 22
<212> PRT
<213> Artificial Sequence
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<220>
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Met Arg Gly Leu Leu Ala Met Leu Val Ala Gly Leu Leu Leu Pro
                                   10
Ile Ala Pro Ala Met Ala
            20
<210> 44
<211> 22
<212> PRT
<213> Artificial Sequence
<223> Description of Artificial Sequence: Synthetic peptide
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Ala Pro Pro Thr Met Ala
           20
<210> 45
<211> 33
<212> DNA
<213> Artificial Sequence
<223> Description of Artificial Sequence: Synthetic oligonucleotide
                                                                       33
geggeegeac tggtgeegeg eggeageete gag
<210> 46
<211> 148
<212> PRT
<213> Homo sapiens
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Ala Asp Gln Leu Thr Glu Glu Gln Ile Ala Glu Phe Lys Glu Ala Phe
Ser Leu Phe Asp Lys Asp Gly Asp Gly Thr Ile Thr Thr Lys Glu Leu
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Gly Thr Val Met Arg Ser Leu Gly Gln Asn Pro Thr Glu Ala Glu Leu
                            40
Gln Asp Met Ile Asn Glu Val Asp Ala Asp Gly Asn Gly Thr Ile Asp
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55

50

Phe Pro Glu Phe Leu Thr Met Met Ala Arg Lys Met Lys Asp Thr Asp 70 Ser Glu Glu Glu Ile Arg Glu Ala Phe Arg Val Phe Asp Lys Asp Gly 85 Asn Gly Tyr Ile Ser Ala Ala Glu Leu Arg His Val Met Thr Asn Leu 105 100 Gly Glu Lys Leu Thr Asp Glu Glu Val Asp Glu Met Ile Arg Glu Ala 120 Asp Ile Asp Gly Asp Gly Gln Val Asn Tyr Glu Glu Phe Val Gln Met 135 130 Met Thr Ala Lys 145 <210> 47 <211> 114 <212> PRT <213> Artificial Sequence <223> Description of Artificial Sequence: Synthetic polypeptide <400> 47 Gln Val Gln Leu Gln Gln Ser Gly Pro Glu Asp Val Lys Pro Gly Ala Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Asp Tyr 25 Tyr Met Asn Trp Val Lys Gln Ser Pro Gly Lys Gly Leu Glu Trp Ile Gly Asp Ile Asn Pro Asn Asn Gly Gly Thr Ser Tyr Asn Gln Lys Phe Lys Gly Arg Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr 75 Met Glu Leu Arg Ser Leu Thr Ser Glu Asp Ser Ser Val Tyr Tyr Cys 90

110

Glu Ser Gln Ser Gly Ala Tyr Trp Gly Gln Gly Thr Thr Val Thr Val

100

105

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Ser Ala
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Glu Ile Lys Arg

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<211> 20
<212> PRT
<213> Artificial Sequence
<223> Description of Artificial Sequence: Synthetic peptide
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Gly Gly Gly Ser
          20
<210> 49
<211> 116
<212> PRT
<213> Artificial Sequence
<220>
<223> Description of Artificial Sequence: Synthetic polypeptide
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Ser Leu Gly Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile
            20
Val His Ser Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro
                            40
        35
Gly Gln Ser Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser
    50
                        55
Gly Val Pro Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr
                    70
65
Leu Lys Ile Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys
                85
Phe Gln Gly Ser His Val Pro Phe Thr Phe Gly Ser Gly Thr Lys Leu
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            100
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<211> 291

<212> PRT

<213> Thermus thermophilus

<400> 50

Met Glu Ala Met Leu Pro Leu Phe Glu Pro Lys Gly Arg Val Leu Leu
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Leu Thr Thr Ser Arg Gly Glu Pro Val Gln Ala Val Tyr Gly Phe Ala 35 40 45

Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Tyr Lys Ala Val Phe 50 55 60

Val Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Glu 65 70 75 80

Ala Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln 85 90 95

Leu Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Phe Thr Arg Leu 100 105 110

Glu Val Pro Gly Tyr Glu Ala Asp Asp Val Leu Ala Thr Leu Ala Lys

Lys Ala Glu Lys Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala Asp Arg 130 135 140

Asp Leu Tyr Gln Leu Val Ser Asp Arg Val Ala Val Leu His Pro Glu 145 150 155 160

Gly His Leu Ile Thr Pro Glu Trp Leu Trp Glu Lys Tyr Gly Leu Arg 165 170 175

Pro Glu Gln Trp Val Asp Phe Arg Ala Leu Val Gly Asp Pro Ser Asp 180 185 190

Asn Leu Pro Gly Val Lys Gly Ile Gly Glu Lys Thr Ala Leu Lys Leu 195 200 205 Leu Lys Glu Trp Gly Ser Leu Glu Asn Leu Leu Lys Asn Leu Asp Arg 215 Val Lys Pro Glu Asn Val Arg Glu Lys Ile Lys Ala His Leu Glu Asp 235 Leu Arg Leu Ser Leu Glu Leu Ser Arg Val Arg Thr Asp Leu Pro Leu 250 Glu Val Asp Leu Ala Gln Gly Arg Glu Pro Asp Arg Glu Gly Leu Arg 265 Ala Phe Leu Glu Arg Leu Glu Phe Gly Ser Leu Leu His Glu Phe Gly 280 285 Leu Leu Glu 290 <210> 51 <211> 196 <212> PRT <213> Escherichia coli Val Ile Ser Tyr Asp Asn Tyr Val Thr Ile Leu Asp Glu Glu Thr Leu Lys Ala Trp Ile Ala Lys Leu Glu Lys Ala Pro Val Phe Ala Phe Asp 20 Thr Glu Thr Asp Ser Leu Asp Asn Ile Ser Ala Asn Leu Val Gly Leu 35 Ser Phe Ala Ile Glu Pro Gly Val Ala Ala Tyr Ile Pro Val Ala His 55 50 Asp Tyr Leu Asp Ala Pro Asp Gln Ile Ser Arg Glu Arg Ala Leu Glu 70 65

Leu Leu Lys Pro Leu Leu Glu Asp Glu Lys Ala Leu Lys Val Gly Gln 85 90 95

Asn Leu Lys Tyr Asp Arg Gly Ile Leu Ala Asn Tyr Gly Ile Glu Leu 100 105 110

Arg Gly Ile Ala Phe Asp Thr Met Leu Glu Ser Tyr Ile Leu Asn Ser 115 120 125

Val Ala Gly Arg His Asp Met Asp Ser Leu Ala Glu Arg Trp Leu Lys 130 135 140

His Lys Thr Ile Thr Phe Glu Glu Ile Ala Gly Lys Gly Lys Asn Gln 145 150 155 160

Leu Thr Phe Asn Gln Ile Ala Leu Glu Glu Ala Gly Arg Tyr Ala Ala 165 170 175

Glu Asp Ala Asp Val Thr Leu Gln Leu His Leu Lys Met Trp Pro Asp 180 185 190

Leu Gln Lys His 195

<210> 52

<211> 686

<212> PRT

<213> Bacillus circulans

<400> 52

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Ile Tyr Gln Ile Phe Thr Asp Arg Phe Ser Asp Gly Asn Pro Ala Asn 20 25 30

Asn Pro Thr Gly Ala Ala Phe Asp Gly Thr Cys Thr Asn Leu Arg Leu 35 40 45

Tyr Cys Gly Gly Asp Trp Gln Gly Ile Ile Asn Lys Ile Asn Asp Gly 50 55 60

Tyr Leu Thr Gly Met Gly Val Thr Ala Ile Trp Ile Ser Gln Pro Val 65 70 75 80

Glu Asn Ile Tyr Ser Ile Ile Asn Tyr Ser Gly Val Asn Asn Thr Ala 85 90 95

Tyr His Gly Tyr Trp Ala Arg Asp Phe Lys Lys Thr Asn Pro Ala Tyr 100 105 110

Gly Thr Ile Ala Asp Phe Gln Asn Leu Ile Ala Ala Ala His Ala Lys 115 120 125

Asn Ile Lys Val Ile Ile Asp Phe Ala Pro Asn His Thr Ser Pro Ala 130 135 140

Ser 145	Ser	Asp	Gln	Pro	Ser 150	Phe	Ala	Glu	Asn	Gly 155	Arg	Leu	Tyr	Asp	Asn 160
Gly	Thr	Leu	Leu	Gly 165	Gly	Tyr	Thr	Asn	Asp 170	Thr	Gln	Asn	Leu	Phe 175	His
His	Asn	Gly	Gly 180	Thr	Asp	Phe	Ser	Thr 185	Thr	Glu	Asn	Gly	Ile 190	Tyr	Lys
Asn	Leu	Tyr 195	Asp	Leu	Ala	Asp	Leu 200	Asn	His	Asn	Asn	Ser 205	Thr	Val	Asp
Val	Tyr 210	Leu	Lys	Asp	Ala	Ile 215	Lys	Met	Trp	Leu	Asp 220	Leu	Gly	Ile	Asp
Gly 225	Ile	Arg	Met	Asp	Ala 230	Val	Lys	His	Met	Pro 235	Phe	Gly	Trp	Gln	Lys 240
Ser	Phe	Met	Ala	Ala 245	Val	Asn	Asn	Tyr	Lys 250	Pro	Val	Phe	Thr	Phe 255	Gly
Glu	Trp	Phe	Leu 260	Gly	Val	Asn	Glu	Val 265	Ser	Pro	Glu	Asn	His 270	Lys	Phe
Ala	Asn	Glu 275	Ser	Gly	Met	Ser	Leu 280	Leu	Asp	Phe	Arg	Phe 285	Ala	Gln	Lys
Val	Arg 290	Gln	Val	Phe	Arg	Asp 295	Asn	Thr	Asp	Asn	Met 300	Tyr	Gly	Leu	Lys
Ala 305		Leu	Glu	Gly	Ser 310		Ala	Asp	Tyr	Ala 315	Gln	Val	Asp	Asp	Gln 320
Val	Thr	Phe	Ile	Asp 325	Asn	His	Asp	Met	Glu 330		Phe	His	Ala	Ser 335	Asn
Ala	Asn	Arg	Arg 340	Lys	Leu	Glu	Gln	Ala 345	Leu	Ala	Phe	Thr	Leu 350	ı Thr	Ser
Arg	Gly	Val 355		Ala	Ile	Tyr	Tyr 360	Gly	Thr	Glu	Gln	Tyr 365	Met	: Ser	Gly
Gly	Thr		Pro	Asp	Asn	Arg 375		Arg	Ile	Pro	Ser 380		e Sei	Thr	Ser

Thr 385	Thr	Ala	Tyr	Gln	Val 390	Ile	Gln	Lys	Leu	A1a 395	Pro	Leu	Arg	ràs	400
Asn	Pro	Ala	Ile	Ala 405	Tyr	Gly	Ser	Thr	Gln 410	Glu	Arg	Trp	Ile	Asn 415	Asn
Asp	Val	Leu	Ile 420	Tyr	Glu	Arg	Lys	Phe 425	Gly	Ser	Asn	Val	Ala 430	Val	Val
Ala	Val	Asn 435	Arg	Asn	Leu	Asn	Ala 440	Pro	Ala	Ser	Ile	Ser 445	Gly	Leu	Val
Thr	Ser 450	Leu	Pro	Gln	Gly	Ser 455	Tyr	Asn	Asp	Val	Leu 460	Gly	Gly	Leu	Leu
Asn 465	Gly	Asn	Thr	Leu	Ser 470	Val	Gly	Ser	Gly	Gly 475	Ala	Ala	Ser	Asn	Phe 480
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Val	Thr	Ile 515	Thr	Ile	Asp	Gly	Arg 520	Gly	Phe	Gly	Ser	Ser 525	Lys	Gly	Thr
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Glu 545	Asp	Thr	Gln	Ile	Lys 550	Val	Lys	Ile	Pro	Ala 555	Val	Ala	Gly	Gly	Asn 560
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Val	Asn	Asn 595	Ala	Thr	Thr	Ala	Leu 600	Gly	Gln	Asn	Val	Tyr 605	Leu	Thr	Gly
Ser	Val	Ser	Glu	Leu	Gly	Asn 615		Asp	Pro	Ala	Lys 620	Ala	ılle	e Gly	Pro

Met Tyr Asn Gln Val Val Tyr Gln Tyr Pro Asn Trp Tyr Tyr Asp Val Ser Val Pro Ala Gly Lys Thr Ile Glu Phe Lys Phe Leu Lys Lys Gln 650 Gly Ser Thr Val Thr Trp Glu Gly Gly Ser Asn His Thr Phe Thr Ala 665 660 Pro Ser Ser Gly Thr Ala Thr Ile Asn Val Asn Trp Gln Pro 680 <210> 53 <211> 399 <212> PRT <213> Bordetella pertussis Met Gln Gln Ser His Gln Ala Gly Tyr Ala Asn Ala Ala Asp Arg Glu Ser Gly Ile Pro Ala Ala Val Leu Asp Gly Ile Lys Ala Val Ala Lys 20 Glu Lys Asn Ala Thr Leu Met Phe Arg Leu Val Asn Pro His Ser Thr 35 Ser Leu Ile Ala Glu Gly Val Ala Thr Lys Gly Leu Gly Val His Ala 55 Lys Ser Ser Asp Trp Gly Leu Gln Ala Gly Tyr Ile Pro Val Asn Pro 70 65 Asn Leu Ser Lys Leu Phe Gly Arg Ala Pro Glu Val Ile Ala Arg Ala 85 Asp Asn Asp Val Asn Ser Ser Leu Ala His Gly His Thr Ala Val Asp 100 105 Leu Thr Leu Ser Lys Glu Arg Leu Asp Tyr Leu Arg Gln Ala Gly Leu 120 115 Val Thr Gly Met Ala Asp Gly Val Val Ala Ser Asn His Ala Gly Tyr 135 130 Glu Gln Phe Glu Phe Arg Val Lys Glu Thr Ser Asp Gly Arg Tyr Ala

145

155

Val Gln Tyr Arg Arg Lys Gly Gly Asp Asp Phe Glu Ala Val Lys Val Ile Gly Asn Ala Ala Gly Ile Pro Leu Thr Ala Asp Ile Asp Met Phe Ala Ile Met Pro His Leu Ser Asn Phe Arg Asp Ser Ala Arg Ser Ser Val Thr Ser Gly Asp Ser Val Thr Asp Tyr Leu Ala Arg Thr Arg Arg Ala Ala Ser Glu Ala Thr Gly Gly Leu Asp Arg Glu Arg Ile Asp Leu Leu Trp Lys Ile Ala Arg Ala Gly Ala Arg Ser Ala Val Gly Thr Glu Ala Arg Arg Gln Phe Arg Tyr Asp Gly Asp Met Asn Ile Gly Val Ile Thr Asp Phe Glu Leu Glu Val Arg Asn Ala Leu Asn Arg Arg Ala His Ala Val Gly Ala Gln Asp Val Val Gln His Gly Thr Glu Gln Asn Asn Pro Phe Pro Glu Ala Asp Glu Lys Ile Phe Val Val Ser Ala Thr Gly Glu Ser Gln Met Leu Thr Arg Gly Gln Leu Lys Glu Tyr Ile Gly Gln Gln Arg Gly Glu Gly Tyr Val Phe Tyr Glu Asn Arg Ala Tyr Gly Val Ala Gly Lys Ser Leu Phe Asp Asp Gly Leu Gly Ala Ala Pro Gly Val Pro Ser Gly Arg Ser Lys Phe Ser Pro Asp Val Leu Glu Thr Val Pro Ala Ser Pro Gly Leu Arg Arg Pro Ser Leu Gly Ala Val Glu Arg

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- Ser Gly Ile Asp Ser Ser His Pro Asp Leu Lys Val Ala Gly Gly Ala 35 40 45
- Ser Met Val Pro Ser Glu Thr Asn Pro Phe Gln Asp Asn Asn Ser His 50 55 60
- Gly Thr His Val Ala Gly Thr Val Ala Ala Leu Asn Asn Ser Ile Gly 65 70 75 80
- Val Leu Gly Val Ala Pro Ser Ala Ser Leu Tyr Ala Val Lys Val Leu 85 90 95
- Gly Ala Asp Gly Ser Gly Gln Tyr Ser Trp Ile Ile Asn Gly Ile Glu 100 105 110
- Trp Ala Ile Ala Asn Asn Met Asp Val Ile Asn Met Ser Leu Gly Gly
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- Pro Ser Gly Ser Ala Ala Leu Lys Ala Ala Val Asp Lys Ala Val Ala 130 135 140
- Ser Gly Val Val Val Val Ala Ala Gly Asn Glu Gly Thr Ser Gly 145 150 155 160
- Ser Ser Ser Thr Val Gly Tyr Pro Gly Lys Tyr Pro Ser Val Ile Ala 165 170 175
- Val Gly Ala Val Asp Ser Ser Asn Gln Arg Ala Ser Phe Ser Ser Val 180 185 190
- Gly Pro Glu Leu Asp Val Met Ala Pro Gly Val Ser Ile Gln Ser Thr 195 200 205
- Leu Pro Gly Asn Lys Tyr Gly Ala Tyr Asn Gly Thr Ser Met Ala Ser 210 215 220

Pro His Val Ala Gly Ala Ala Ala Leu Ile Leu Ser Lys His Pro Asn 225 230 235 240

Trp Thr Asn Thr Gln Val Arg Ser Ser Leu Glu Asn Thr Thr Thr Lys 245 250 255

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Asn Tyr Asn Asn Gly Pro Val Leu Ser Arg Phe Val Gln Lys Val Leu 50 60

Asp Glu Thr Gly Ala Lys Lys Val Asp Ile Val Ala His Ser Met Gly 65 70 75 80

Gly Ala Asn Thr Leu Tyr Tyr Ile Lys Asn Leu Asp Gly Gly Asn Lys 85 90 95

Val Ala Asn Val Val Thr Leu Gly Gly Ala Asn Arg Leu Thr Thr Gly 100 105 110

Lys Ala Leu Pro Gly Thr Asp Pro Asn Gln Lys Ile Leu Tyr Thr Ser 115 120 125

Ile Tyr Ser Ser Ala Asp Met Ile Val Met Asn Tyr Leu Ser Arg Leu 130 135 140

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Leu Ala Leu A 35	la Ala Ala	Arg Gly 40	Gly Ar	g Val	His Arg	g Ala	Pro	Glu	
Pro Tyr Lys A 50	ala Leu Arg	Asp Leu 55	Lys Gl	u Ala	Arg Gly	/ Leu	ı Lev	ı Ala	

Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Gly Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg 290 295

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Glu	Asn	Leu	Ile 340	Arg	Val	Phe	Gln	Glu 345	Gly	Arg	Asp	Ile	His 350	Thr	Glu
Thr	Ala	Ser 355	Trp	Met	Phe	Gly	Val 360	Pro	Arg	Glu	Ala	Val 365	Asp	Pro	Leu
Met	Arg 370	Arg	Ala	Ala	Lys	Thr 375	Ile	Asn	Phe	Gly	Val 380	Leu	Tyr	Gly	Met
Ser 385	Ala	His	Arg	Leu	Ser 390	Gln	Glu	Leu	Ala	Ile 395	Pro	Tyr	Glu	Glu	Ala 400
Gln	Ala	Phe	Ile	Glu 405	Arg	Cys	Phe	Gln	Ser 410	Phe	Pro	Lys	Val	Arg 415	Ala
Trp	Ile	Glu	Lys 420	Thr	Leu	Glu	Glu	Gly 425	Arg	Arg	Arg	Gly	Tyr 430	Val	Glu
Thr	Leu	Phe 435	Gly	Arg	Arg	Arg	Tyr 440	Val	Pro	Asp	Leu	Glu 445	Ala	Arg	Val
Lys	Ser 450	Val	Arg	Glu	Ala	Ala 455	Glu	Arg	Met	Ala	Phe 460		Met	Pro	Val
Gln 465	Gly	Thr	Ala	Ala	Asp 470	Leu	Met	Lys	Leu	Ala 475		Val	Lys	Leu	Ph∈ 480
Pro	Arg	Leu	Glu	Glu 485	Met	Gly	Ala	Arg	Met 490	Leu	Leu	Gln	Val	His 495	Asp
Glu	Leu	Val	Leu 500	Glu	Ala	Pro	Lys	Glu 505		Ala	Glu	. Ala	Val	Ala	Arc
Leu	Val	Lys 515	Glu	Val	Met	Glu	Gly 520	Val	Tyr	Pro	Leu	Ala 525	ı Val	Pro	Leu
Glu	Val 530	Glu	Val	Gly	Ile	Gly 535	Glu	Asp	Trp	Leu	Ser 540		ı Lys	s Glu	Ala

Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu 305 310 315 320

Ala

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Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430

Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 470 475

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp 485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg 500 505 510

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Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala	
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Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met 370 375 380

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Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430

Thr Leu Phe Gly Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val
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Lys Ser Val Arg Glu Ala Ala Glu Arg Lys Ala Phe Asn Met Pro Val 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 475 480

Pro Arg Leu Glu Glu Met Glu Ala Arg Met Leu Leu Gln Val His Asp 485 490 495

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<211> 1637

<212> DNA

<213> Thermus aquaticus

<220>

<221> CDS

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- Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val 225 230 235 240
- Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr 245 250 255

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Lys	Ser 450	Val	Arg		Ala						Ser 460		Met	Pro	Val
Gln 465		Thr	Ala	Ala	Asp 470	Leu	Met	Lys	Leu	Ala 475	Met	Val	Lys	Leu	Phe 480
Pro	Arg	Leu	Glu	Glu 485	Met	Gly	Ala	Arg	Met 490		Leu	Gln	Val	His 495	Asp
Glu	Leu	Val	Leu 500	Glu	Ala	Pro	Lys	Glu 505	Gly	Ala	Glu	Ala	Val	Ala	Arg
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Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala

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atg Met	cgc Arg 370	Arg	gcg Ala	gcc Ala	aag Lys	acc Thr 375	atc Ile	aac Asn	ttc Phe	Gly 999	gtc Val 380	. Leu	tac Tyr	gly ggc	atg Met	1152	:
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Pro Ty 50	_	Ala	Leu	Arg	Asp 55	Leu	Lys	Glu	Ala	Arg 60	Gly	Leu	ı Lev	ı Ala	
Lys As	p Leu	Ser	Val	Leu	Ala	Leu	Arg	Glu	Gly	Leu	Gly	Leu	ı Pro	Pro	

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- Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu 100 105 110
- Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp 115 120 125
- Gly Arg Leu Glu Glu Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val 130 135 140
- Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val
- Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu 165 170 175
- Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro 180 185 190
- Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu
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- Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser 210 215 220
- Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val 225 230 235 240
- Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr 245 250 255
- Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His 260 265 270
- Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser 275 280 285
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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu
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                                                                      144
ctq gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag
Leu Ala Leu Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu
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Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc
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Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro
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65
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acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag
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Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu
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145
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Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu
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195 200 205

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ccc agg ctg gag gaa atg ggg gcc ag Pro Arg Leu Glu Glu Met Gly Ala Ar 485	gg atg ctc ctt cag gtc cac gac 1488 rg Met Leu Leu Gln Val His Asp 490 495
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100	105	110

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gag Glu	aac Asn	ctg Leu	atc Ile 340	cgg Arg	gtc Val	ttc Phe	cag Gln	gag Glu 345	gly aaa	cgg Arg	gac Asp	atc Ile	cac His 350	acg Thr	gag Glu	105	6
acc Thr	gcc Ala	agc Ser 355	tgg Trp	atg Met	ttc Phe	ggc Gly	gtc Val 360	ccc Pro	cgg Arg	gag Glu	gcc Ala	gtg Val 365	gac Asp	ccc Pro	ctg Leu	110	4
atg Met	cgc Arg 370	cgg Arg	gcg Ala	gcc Ala	aag Lys	acc Thr 375	atc Ile	aac Asn	ttc Phe	gly ggg	gtc Val 380	ctc Leu	tac Tyr	ggc Gly	atg Met	115	2
tcg Ser 385	gcc Ala	cac	cgc Arg	ctc Leu	tcc Ser 390	cag Gln	gag Glu	cta Leu	gcc Ala	atc Ile 395	cct Pro	tac Tyr	gag Glu	gag Glu	gcc Ala 400	120	0
cag Gln	gcc Ala	ttc Phe	att Ile	gag Glu 405	cgc Arg	tac Tyr	ttt Phe	cag Gln	agc Ser 410	ttc Phe	ccc Pro	aag Lys	gtg Val	cgg Arg 415	gcc Ala	124	8
tgg Trp	att Ile	gag Glu	aag Lys 420	acc Thr	ctg Leu	gag Glu	gag Glu	ggc Gly 425	agg Arg	agg Arg	cgg Arg	Gly aaa	tac Tyr 430	gtg Val	gag Glu	129	6
acc Thr	ctc Leu	ttc Phe 435	ggc Gly	cgc Arg	cgc Arg	cgc Arg	tac Tyr 440	gtg Val	cca Pro	gac Asp	cta Leu	gag Glu 445	gcc Ala	cgg Arg	gtg Val	134	4
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cag Gln 465	ggc Gly	acc Thr	gcc Ala	gcc Ala	gac Asp 470	ctc Leu	atg Met	aag Lys	ctg Leu	gct Ala 475	atg Met	gtg Val	aag Lys	ctc Leu	ttc Phe 480	144	. O
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gag Glu	ctg Leu	gtc Val	ctc Leu 500	gag Glu	gcc Ala	cca Pro	aaa Lys	gag Glu 505	GJA aaa	gcg Ala	gag Glu	gcc Ala	gtg Val 510	gcc Ala	cgg Arg	153	6
ctg Leu	gcc Ala	aag Lys 515	gag Glu	gtc Val	atg Met	gag Glu	999 Gly 520	gtg Val	tat Tyr	ccc Pro	ctg Leu	gcc Ala 525	. Val	ccc Pro	ctg Leu	158	34
gag Glu	gtg Val 530	gag Glu	gtg Val	gly aaa	ata Ile	999 535	gag Glu	gac Asp	tgg Trp	ctc Leu	tcc Ser 540	Ala	aag Lys	gag Glu	gcg Ala	163	32

gcc gc Ala 545

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<212> PRT

<213> Thermus aquaticus

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Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu 35 40 45

Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala 50 55 60

Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro 70 75 80

Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr 85 90 95

Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu 100 105 110

Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp 115 120 125

Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val 130 135 140

Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val 145 150 155 160

Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu 165 170 175

Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro 180 185 190

Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu

195 200 205

Leu	Gly 210	Leu	Pro	Ala	Ile	Gly 215	Lys	Thr	Glu	Lys	Thr 220	GIÀ	гàг	Arg	ser
Thr 225	Ser	Ala	Ala	Val	Leu 230	Glu	Ala	Leu	Arg	Glu 235	Ala	His	Pro	Ile	Val 240
Glu	Lys	Ile	Leu	Gln 245	Tyr	Arg	Glu	Leu	Thr 250	Lys	Leu	Lys	Ser	Thr 255	Tyr
Ile	Asp	Pro	Leu 260	Pro	Asp	Leu	Ile	His 265	Pro	Arg	Thr	Gly	Arg 270	Leu	His
Thr	Arg	Phe 275	Asn	Gln	Thr	Ala	Thr 280	Ala	Thr	Gly	Arg	Leu 285	Ser	Ser	Ser
Asp	Pro 290	Asn	Leu	Gln	Asn	Ile 295	Pro	Val	Arg	Thr	Pro 300	Leu	Gly	Gln	Arg
Ile 305	Arg	Arg	Ala	Phe	Ile 310	Ala	Glu	Glu	Gly	Trp 315	Leu	Leu	Val	Ala	Leu 320
Asp	Tyr	Ser	Gln	Ile 325	Glu	Leu	Arg	Val	Leu 330	Ala	His	Leu	Ser	Gly 335	Asp
Glu	Asn	Leu	Ile 340	Arg	Val	Phe	Gln	Glu 345	Gly	Arg	Asp	Ile	His 350	Thr	Glu
Thr	Ala	Ser 355	Trp	Met	Phe	Gly	Val 360	Pro	Arg	Glu	Ala	Val 365	Asp	Pro	Leu
Met	Arg 370	Arg	Ala	Ala	Lys	Thr 375	Ile	Asn	Phe	Gly	Val 380	Leu	Tyr	Gly	Met
Ser 385	Ala	His	Arg	Leu	Ser 390	Gln	Glu	Leu	Ala	Ile 395	Pro	Tyr	Glu	Glu	Ala 400
Gln	Ala	Phe	Ile	Glu 405	Arg	Tyr	Phe	Gln	Ser 410		Pro	Lys	Val	Arg 415	Ala
Trp	Ile	Glu	Lys 420	Thr	Leu	Glu	Glu	Gly 425	Arg	Arg	Arg	Gly	Tyr 430	Val	Glu
Thr	Leu	Phe 435	Gly	Arg	Arg	Arg	Tyr 440	Val	Pro	Asp	Leu	Glu 445		Arg	Val

Lys Ser Val Arg Glu Ala Ala Glu Arg Lys Ala Phe Asn Met Pro Val 450 455 460	
Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 475 480	
Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp 485 490 495	
Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg 500 505 510	
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gcg Ala	Gly ggg	gag Glu 115	cgg Arg	gcc Ala	gcc Ala	ctt Leu	tcc Ser 120	gag Glu	agg Arg	ctc Leu	ttc Phe	gcc Ala 125	aac Asn	ctg Leu	tgg Trp	384
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cta Leu	999 Gly 210	ctt Leu	ccc Pro	gcc Ala	atc Ile	ggc Gly 215	aag Lys	acg Thr	gag Glu	aag Lys	acc Thr 220	ggc Gly	aag Lys	cgc Arg	tcc Ser	672
acc Thr 225	agc Ser	gcc Ala	gcc Ala	gtc Val	ctg Leu 230	gag Glu	gcc Ala	ctc Leu	cgc Arg	gag Glu 235	gcc Ala	cac His	ccc Pro	atc Ile	gtg Val 240	720
gag Glu	aag Lys	atc Ile	Leu	cag Gln 245	Tyr	cgg Arg	Glu	Leu	Thr	Lys	ctg Leu	Lys	Ser	acc Thr 255	Tyr	768
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acc Thr	cgc Arg	ttc Phe 275	aac Asn	cag Gln	acg Thr	gcc Ala	acg Thr 280	gcc Ala	acg Thr	ggc	agg Arg	cta Leu 285	Ser	agc Ser	tcc Ser	864
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gac Asp	tat Tyr	agc Ser	cag Gln	ata Ile	gag Glu	ctc Leu	agg Arg	gtg Val	ctg Leu	gcc Ala	cac His	ctc Leu	tcc Ser	ggc Gly	gac Asp	1008

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tcg Ser 385	gcc Ala	cac His	cgc Arg	ctc Leu	tcc Ser 390	cag Gln	gag Glu	cta Leu	gcc Ala	atc Ile 395	cct Pro	tac Tyr	gag Glu	gag Glu	gcc Ala 400	1200	
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acc Thr	ctc Leu	ttc Phe 435	ggc Gly	cgc Arg	cgc Arg	cgc Arg	tac Tyr 440	gtg Val	cca Pro	gac Asp	cta Leu	gag Glu 445	gcc Ala	cgg Arg	gtg Val	1344	:
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gcc Ala 545	-															163	7
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<212> PRT <213> Thermus aquaticus

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Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu 35 40 45

Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala 50 55 60

Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro 65 70 75 80

Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr 85 90 95

Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu 100 105 110

Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp 115 120 125

Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val 130 135 140

Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val 145 150 155 160

Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu
165 170 175

Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro 180 185 190

Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu 195 200 205

Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser 210 215 220

Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val

- Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr 245 250 255
- Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His 260 265 270
- Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser 275 280 285
- Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg 290 295 300
- Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu 305 310 315 320
- Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp 325 330 335
- Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu 340 345 350
- Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu 355 360 365
- Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met 370 375 380
- Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala 385 390 395 400
- Gln Ala Phe Ile Glu Arg Asn Phe Gln Ser Phe Pro Lys Val Arg Ala 405 410 415
- Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430
- Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445
- Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val 450 455 460
- Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His As 485 490 495	sp
Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Ar 500 505 510	rg
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ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc g Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro G 35 40 45	gag 144 Blu
cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc g Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu A 50 55 60	gcc 192 Ala
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg c Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro P 65 70 75 8	ecc 240 Pro 30
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac a Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn T 85 90 95	acc 288 Thr
acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag g Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu G 100 105 110	gag 336 Glu
geg ggg gag egg gee gee ett tee gag agg ete tte gee aac etg t	tgg 384

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gag Glu	atc Ile	gcc Ala	cgc Arg 180	ctc Leu	gag Glu	gcc Ala	gag Glu	gtc Val 185	ttc Phe	cgc Arg	ctg Leu	gcc Ala	ggc Gly 190	cac His	ccc Pro	576
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acc Thr 225	agc Ser	gcc Ala	gcc Ala	gtc Val	ctg Leu 230	gag Glu	gcc Ala	ctc Leu	cgc Arg	gag Glu 235	gcc Ala	cac His	ccc Pro	atc Ile	gtg Val 240	720
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acc Thr	cgc Arg	Phe	Asn	Gln	acg Thr	Ala	Thr	Ala	Thr	Gly	Arg	cta Leu 285	agt Ser	agc Ser	tcc Ser	864
gat	ccc	aac														
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		cgg Arg														1152
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Leu	Ala	Leu 35	Ala	Ala	Ala	Arg	Gly 40	Gly	Arg	Val	His	Arg 45	Ala	Pro	Glu
Pro	Tyr 50	Lys	Ala	Leu	Arg	Asp 55	Leu	Lys	Glu	Ala	Arg 60	Gly	Leu	Leu	Ala
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Gly	Asp	Asp	Pro	Met 85	Leu	Leu	Ala	Tyr	Leu 90	Leu	Asp	Pro	Ser	Asn 95	Thr
Thr	Pro	Glu	Gly 100	Val	Ala	Arg	Arg	Tyr 105	Gly	Gly	Glu	Trp	Thr 110	Glu	Glu
Ala	Gly	Glu 115	Arg	Ala	Ala	Leu	Ser 120	Glu	Arg	Leu	Phe	Ala 125	Asn	Leu	Trp
Gly	Arg 130	Leu	Glu	Gly	Glu	Glu 135	Arg	Leu	Leu	Trp	Leu 140	Tyr	Arg	Glu	Val
Glu 145	Arg	Pro	Leu	Ser	Ala 150	Val	Leu	Ala	His	Met 155	Glu	Ala	Thr	Gly	Val 160
Arg	Leu	Asp	Val	Ala 165	Tyr	Leu	Arg	Ala	Leu 170	Ser	Leu	Glu	Val	Ala 175	Glu
Glu	Ile	Ala	Arg 180	Leu	Glu	Ala	Glu	Val 185	Phe	Arg	Leu	Ala	Gly 190	His	Pro
Phe	Asn	Leu 195	Asn	Ser	Arg	Asp	Gln 200	Leu	Glu	Arg	Val	Leu 205	Phe	Asp	Glu
Leu	Gly 210	Leu	Pro	Ala	Ile	Gly 215	Lys	Thr	Glu	Lys	Thr 220	Gly	Lys	Arg	Ser
Thr 225	Ser	Ala	Ala	Val	Leu 230	Glu	Ala	Leu	Arg	Glu 235	Ala	His	Pro	Ile	Val 240
Glu	Lys	Ile	Leu	Gln 245	Tyr	Arg	Glu	Leu	Thr 250	Lys	Leu	Lys	Ser	Thr 255	Tyr
Ile	Asp	Pro	Leu	Pro	Asp	Leu	Ile	His	Pro	Arg	Thr	Gly	Arg	Leu	His

260 265 270

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Ile 305	Arg	Arg	Ala	Phe	Ile 310	Ala	Glu	Glu	Gly	Trp 315	Leu	Leu	Val	Ala	Leu 320
Asp	Tyr	Ser	Gln	Ile 325	Glu	Leu	Arg	Val	Leu 330	Ala	His	Leu	Ser	Gly 335	Asp
Glu	Asn	Leu	Ile 340	Arg	Val	Phe	Gln	Glu 345	Gly	Arg	Asp	Ile	His 350	Thr	Glu
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Ser 385	Ala	His	Arg	Leu	Ser 390	Gln	Glu	Leu	Ala	Ile 395	Pro	Tyr	Glu	Glu	Ala 400
Gln	Ala	Phe	Ile	Glu 405	Arg	Cys	Phe	Gln	Ser 410	Phe	Pro	Lys	Val	Arg 415	Ala
Trp	Ile	Glu	Lys 420	Thr	Leu	Glu	Glu	Gly 425	Arg	Arg	Arg	Gly	Tyr 430	Val	Glu
Thr	Leu	Phe 435	Gly	Arg	Arg	Arg	Tyr 440	Val	Pro	Asp	Leu	Glu 445	Ala	Arg	Val
Lys	Ser 450	Val	Arg	Glu	Ala	Ala 455	Glu	Arg	Met	Ala	Phe 460	Asn	Met	Pro	Val
Gln 465	Gly	Thr	Ala	Ala	Asp 470	Leu	Met	Lys	Leu	Ala 475	Met	Val	Lys	Leu	Phe 480
Pro	Arg	Leu	Glu	Glu 485	Met	Gly	Ala	Arg	Met 490		Leu	Gln	Val	His 495	Asp
Glu	Leu	Val	Leu 500	Glu	Ala	Pro	Lys	Glu 505	Gly	Ala	Glu	Ala	Val 510		Arg

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480

gag agg ecc ett tee get gte etg gee eac atg gag gee acg ggg gtg

Glu 145	Arg	Pro	Leu	Ser	Ala 150	Val	Leu	Ala	His	Met 155	Glu	Ala	Thr	Gly	Val 160	
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gag Glu	atc Ile	gcc Ala	cgc Arg 180	ctc Leu	gag Glu	gcc Ala	gag Glu	gtc Val 185	ttc Phe	cgc Arg	ctg Leu	gcc Ala	ggc Gly 190	cac His	ccc Pro	576
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cta Leu	999 Gly 210	ctt Leu	ccc Pro	gcc Ala	atc Ile	ggc Gly 215	aag Lys	acg Thr	gag Glu	aag Lys	acc Thr 220	ggc Gly	aag Lys	cgc Arg	tcc Ser	672
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gat Asp	ccc Pro 290	aac Asn	ctc Leu	cag Gln	aac Asn	atc Ile 295	ccc Pro	gtc Val	cgc Arg	acc Thr	ccg Pro 300	ctt Leu	gjà aaa	cag Gln	agg Arg	912
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gag Glu	aac Asn	ctg Leu	atc Ile 340	cgg Arg	gtc Val	ttc Phe	cag Gln	gag Glu 345	Gly aaa	agg Arg	gac Asp	atc Ile	cac His 350	acg Thr	gag Glu	1056
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atg Met	cgc Arg 370	cgg Arg	gcg Ala	gcc Ala	aag Lys	acc Thr 375	atc Ile	aac Asn	ttc Phe	gly aaa	gtc Val 380	Leu	tac Tyr	ggc	atg Met	1152
+ 00		~~~	aaa	ata	+ ~ ~	cad	gag	cta	acc	atc	cct	tac	gac	gaq	acc	1200

385				390					395					400	
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tgg at Trp Il															1296
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cag gg Gln Gl 465	gc acc ly Thr	gcc Ala	gcc Ala	gac Asp 470	ctc Leu	atg Met	aag Lys	ctg Leu	gct Ala 475	atg Met	gtg Val	aag Lys	ctc Leu	ttc Phe 480	1440
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ctg go Leu Al	cc aag la Lys 515	Glu	gtc Val	atg Met	gag Glu	999 Gly 520	gtg Val	tat Tyr	ccc Pro	ctg Leu	gcc Ala 525	gtg Val	ccc Pro	ctg Leu	1584
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Leu A	la Lei 35	ı Ala	Ala	Ala	Arg	Gly 40	Gly	Arg	Val	His	Arg 45	Ala	Pro	Glu	

Pro	Tyr 50	Lys	Ala	Leu	Arg	Asp 55	Leu	Lys	Glu	Ala	Arg 60	GIÀ	Leu	Leu	Ala
Lys 65	Asp	Leu	Ser	Val	Leu 70	Ala	Leu	Arg	Glu	Gly 75	Leu	Gly	Leu	Pro	Pro 80
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Ala	Gly	Glu 115	Arg	Ala	Ala	Leu	Ser 120	Glu	Arg	Leu	Phe	Ala 125	Asn	Leu	Trp
Gly	Arg 130	Leu	Glu	Gly	Glu	Glu 135	Arg	Leu	Leu	Trp	Leu 140	Tyr	Arg	Glu	Val
Glu 145	Arg	Pro	Leu	Ser	Ala 150	Val	Leu	Ala	His	Met 155	Glu	Ala	Thr	Gly	Val 160
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Thr 225	Ser	Ala	Ala	Val	Leu 230	Glu	Ala	Leu	Arg	Glu 235	Ala	His	Pro	Ile	Val 240
Glu	Lys	Ile	Leu	Gln 245	Tyr	Arg	Glu	Leu	Thr 250	Lys	Leu	Lys	Ser	Thr 255	Tyr
Ile	Asp	Pro	Leu 260	Pro	Asp	Leu	Ile	His 265	Pro	Arg	Thr	Gly	Arg 270	Leu	His
Thr	Arg	Phe 275	Asn	Gln	Thr	Ala	Thr 280	Ala	Thr	Gly	Arg	Leu 285	Ser	Ser	Ser
71 ~ ~	Dro	7 an	T.All	Gln	Δen	Tle	Pro	Val	Ara	Thr	Pro	Leu	Glv	Gln	Ara

290 295 300

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Glu	Asn	Leu	Ile 340	Arg	Val	Phe	Gln	Glu 345	Gly	Arg	Asp	Ile	His 350	Thr	Glu
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aag agc gtg c Lys Ser Val A 450	gg gag gcg gcd rg Glu Ala Ala 45	c gag cgc atg go a Glu Arg Met Al 5	cc ttc aac atg la Phe Asn Met 460	ccc gtc 1392 Pro Val
cag ggc acc g Gln Gly Thr A 465	gcc gcc gac cto la Ala Asp Leo 470	c atg aag ctg go 1 Met Lys Leu A 4	ct atg gtg gag la Met Val Glu 75	ctc ttc 1440 Leu Phe 480
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Glu Leu Val L	etc gag gcc cc eu Glu Ala Pro	a aaa gag ggg g o Lys Glu Gly A 505	cg gag gcc gtg la Glu Ala Val 510	gcc cgg 1536 Ala Arg
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Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp 325 330 335

Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu 340 345 350

Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu 355 360 365

Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met 370 375 380

Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala 385 390 395 400

Gln Ala Phe Ile Glu Arg Cys Phe Gln Ser Phe Pro Lys Val Arg Ala 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430

Thr Leu Phe Gly Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Glu Leu Phe 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp 485 490 495

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672

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acc Thr	ctc Leu	ttc Phe 435	ggc	cgc Arg	cgc Arg	cgc Arg	tac Tyr 440	gtg Val	cca Pro	gac Asp	cta Leu	gag Glu 445	Ala	cgg Arg	gtg Val	1344
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Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp 120 Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val 135 Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val 155 Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu 170 Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro 185 180 Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu 200 195 Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser 215 210 Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val 230 Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr 245 Ile Asp Pro Leu Pro Gly Leu Ile His Pro Arg Thr Gly Arg Leu His 265 260 Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser 280 275 Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg 295 290 Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu 315 305 310 Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp 325 330 Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu 345 340 Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu 355 360 365

Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met 370 375 380

Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala 385 390 395 400

Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430

Thr Leu Phe Gly Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Ile His Asp 485 490 495

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<212> DNA

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<220>

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cct Pro	tat Tyr 50	aaa Lys	gcc Ala	ctc Leu	agg Arg	gac Asp 55	ctg Leu	aag Lys	gag Glu	gcg Ala	cgg Arg 60	Gly 999	ctt Leu	ctc Leu	gcc Ala	192
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Pro Tyr Lys 50	Ala Leu Arg	Asp Leu Lys 55	Glu Ala Arg Gl 60	y Leu Leu Ala								
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Gly Asp Asp	Pro Met Leu 85	Leu Ala Tyr	Leu Leu Asp Pr 90	o Ser Asn Thr 95								
Thr Pro Glu	Gly Val Ala 100	Arg Arg Tyr	Gly Gly Glu Tr	p Thr Glu Glu 110								
Ala Gly Glu 115	Arg Ala Ala	Leu Ser Glu 120	Arg Leu Phe Al 12									
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Met	Arg 370	Arg	Ala	Ala	Lys	Thr 375		Asn	Phe	Gly	Val 380		Туг	: Gly	Met
Ser	Ala	His	Arg	Leu	Ser	Gln	Glu	Leu	Ala	Ile	Pro	Tyr	Glu	ı Glu	ı Ala

Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430

Thr Leu Phe Gly Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp 485 490 495

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	Val	Pro	Gly 115	Tyr	Glu	Ala	Asp	Asp 120	Val	Leu	Ala	Ser	Leu 125	Ala	Lys	Lys
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	Asp	Gln	Trp	Ala 180	Asp	Tyr	Arg	Ala	Leu 185	Thr	Gly	Asp	Glu	Ser 190	Asp	Asn
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290 295 300

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Pro	Gly 370	Asp	Asp	Pro	Met	Leu 375	Leu	Ala	Tyr	Leu	Leu 380	Asp	Pro	Ser	Asn
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Trp	Gly	Arg	Leu 420	Glu	Gly	Glu	Glu	Arg 425	Leu	Leu	Trp	Leu	Tyr 430	Arg	Glu
Val	Glu	Arg 435	Pro	Leu	Ser	Ala	Val 440	Leu	Ala	His	Met	Glu 445	Ala	Thr	Gly
Val	Arg 450	Leu	Asp	Val	Ala	Tyr 455	Leu	Arg	Ala	Leu	Ser 460	Leu	Glu	Val	Ala
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Pro	Phe	Asn	Leu	Asn 485	Ser	Arg	Asp	Gln	Leu 490		Arg	Val	Leu	Phe 495	Asp
Glu	Leu	Gly	Leu 500	Pro	Ala	Ile	Gly	Lys 505		Glu	Lys	Thr	Gly 510	. Tàs	Arg
Ser	Thr	Ser 515		Ala	Val	Leu	Glu 520		Leu	. Arg	Glu	1 Ala 525		Pro	Ile
Val	Glu 530		Ile	Leu	Gln	Tyr 535		Glu	Leu	Thr	Lys 540		Lys	Ser	Thr

Tyr 545	Ile	Asp	Pro	Leu	Pro 550	Asp	Leu	Ile	His	Pro 555	Arg	Thr	Gly	Arg	Leu 560
His	Thr	Arg	Phe	Asn 565	Gln	Thr	Ala	Thr	Ala 570	Thr	Gly	Arg	Leu	Ser 575	Ser
Ser	Asp	Pro	Asn 580	Leu	Gln	Asn	Ile	Pro 585	Val	Arg	Thr	Pro	Leu 590	Gly	Gln
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Glu	Thr	Ala	Ser	Trp 645	Met	Phe	Gly	Val	Pro 650	Arg	Glu	Ala	Val	Asp 655	Pro
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Glu	Thr	Leu	Phe	Gly 725	Arg	Arg	Arg	Tyr	Val 730		Asp	Leu	Glu	Ala 735	Arg
Val	Lys	Ser	Val 740	Arg	Glu	Ala	Ala	Glu 745	Arg	Met	Ala	Phe	Asn 750		Pro
Val	Gln	Gly 755	Thr	Ala	Ala	Asp	Leu 760	Met	Lys	Leu	Ala	Met 765		Lys	Leu
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